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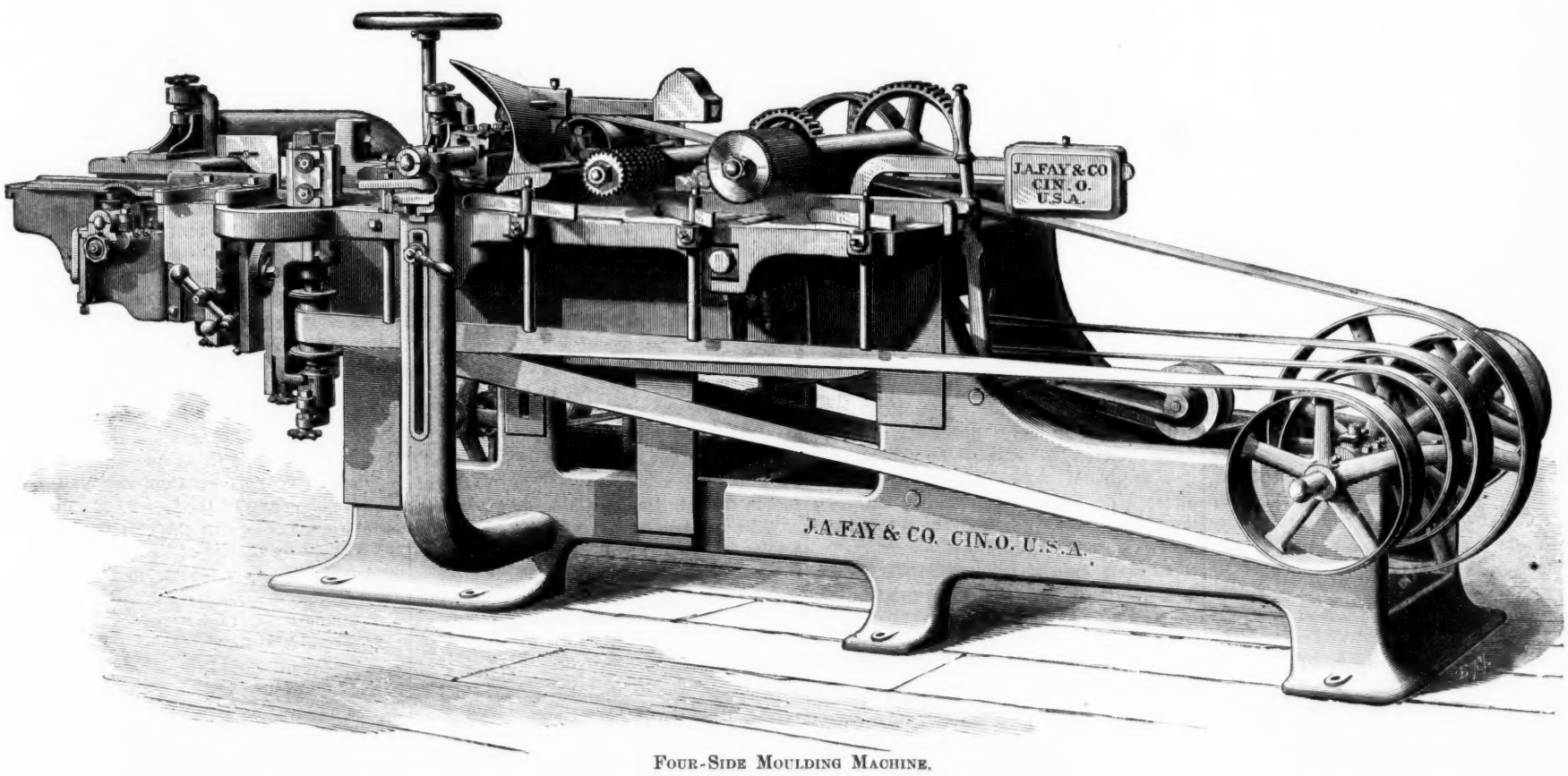
ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Improved Heavy Four-Side Moulding Machine.

We present herewith an illustration of an improved Four-Side Patent Moulding Machine, made by J. A. Fay & Co., 267 to 285 Front Street, Cincinnati, O. It is a specially heavy and strong machine, made to work 8 or 10 inches wide as may be desired. The frame is long, in order to give good length of belts, and secure a large base upon the floor. The feed works are very strong, consisting of three feed rollers, two above and one in the platen, all connected and driven by a train of powerful expansion gearing, which will allow the bed to drop to take in 16″. The lower feed roll (which is in the bed) is of large diameter, and runs in adjustable bearings. The upper rolls are mounted in swinging yokes and so arranged as to always rise parallel with the stuff being worked, and can be instantly raised so as to withdraw it from the knives if desired. The roll nearest the cutter head is of smaller diameter, and placed as close to the pressure bar as possible.

The cutter heads are four in number, and slotted upon their faces. The main or upper head is mounted upon a very heavy arbor which runs in self-oiling boxes and has a substantial detachable outside bearing, both for an outside support and for convenience in substituting other heads, also an end adjustment across the platen. The under head and both side heads are mounted on the bed of the platen, and rise and fall with it. The former has an end adjustment, by means of a hand wheel. The latter has an angular and vertical adjustment independent of the bed, and can be adjusted laterally out or in from the working side of the machine. The table has movable mouth pieces let in flush with the face, which can be adjusted more or less to close the gap of the lower head.

An upright column attached to the outside of the machine extending up from the floor receives the movable detachable bearing and affords a very solid outside support for the mandrel, essential for accurate work. The bed or platen is raised or lowered to any desired height by means of the hand wheel in front, and instantly secured in position by the checking lever. This is a valuable improvement, as all danger to the operator from contact with the cutters in raising the bed, as in the old method with the elevating screw placed above, is entirely avoided. The feed is instantly stopped or started by means of a binding lever, and without jar or shock. The pressure bar and bonnet are combined, and can be swung instantly out of the way to secure ready access to the cutters. The machine is equipped with hold-downs, wrenches, pressure, feed, etc. The countershaft has 10 in. by 6 in. tight and loose pulleys, and should make 1,000 revolutions per minute.



FOUR-SIDE MOULDING MACHINE.

Word was left at the office of one of our prominent engine builders the other day to the following effect: "Mr. Carpenter wants Mr. Blank to drop into our office some day when he is going by and indicate our engine, as we would like to know how much power we are using." We believe Mr. Blank dropped in.

We have a neighbor who, though not only a pretty good mechanic, is also a pretty good hand at the exhaust, and the other evening, while having on a pretty good head of steam, was explaining to his neighbor, Housey, the character of a machine he had been building. He said: "Do you know, Housey, I built all that machine myself, and I never made but one little mistake, and you couldn't call that a mistake, either, *because you could utilize it for something else!*"

Early Engineering Reminiscences.

BY GEORGE ESCOL SELLERS.

TENTH PAPER.

From the commencement of the New York and Erie Canal by the State in 1817 until its completion, it was looked at with no little jealousy by the Middle and seaboard Southern States, because, if successful, it would change the stream of immigration through them that was at that time peopling the valleys of the great western rivers. It was therefore not surprising that the question of maintaining their position made that of internal improvement in transportation the paramount one of the day. I remember well that this was almost the absorbing subject of conversation among all classes. Steamboats on the rivers had done much; still more was required.

It may be profitable to glance at the state of travel and transportation of produce and merchandise at that time, or even to go back of that period a few years. Governor John Renolds, of Illinois, in his reminiscence of his "Own Times," gives a brief account of the emigration of his father and family—of which he was the eldest of six children, and then a boy of twelve years and driver of one of the wagons—from Tennessee to Kaskaskia, in the Indian country, now the State of Illinois, their objective point being the lead mines of what was then called New Spain, now the State of Missouri. It was in the spring of 1800 that they crossed the Ohio River at what is now the city of Golconda, on the Illinois side of the river, a distance of only 110 miles from Kaskaskia, the nearest settlement, to reach which, with their two wagons and five horses, cutting their way through fallen timber blown down by a cyclone, rafting over five or six streams, was the work of four weary weeks. They located at Kaskaskia, like many other emigrants of the time, stopping short of their intended destination. I refer to this case as Governor John Renolds was one of the active, energetic workers and efficient promoters of internal improvements in a State that now numbers its miles of railroads by the thousands, while New Spain, now the adjoining State of Missouri, has within its bounds 4,118 miles. Governor Renolds built the first railroad west of the Allegheny Mountains, in the Mississippi Valley, in the year 1836. This road was only six miles long, from the coal mines in the bluff opposite St. Louis to the Mississippi River; still, it was a work of considerable engineering skill, crossing a lake on a pile bridge over 2,000 feet long, three piles on top of one another, and driven over eighty feet deep. The New England States, being off from the great lines of travel, and the nature of the soil being better adapted for common dirt roads, they did not partake of the excitement of the Middle and Southern States, where the roads became impassable for loaded wagons during much of the fall, winter, and spring months. In some cases these difficulties were in a measure overcome by corduroy roads; in others with charcoal, or gravel where obtainable. Near the great cities and in thickly-settled parts of the country, by well-rounded and drained stone-pikes as tollage roads, none of which required any great engineering skill; yet they were schools in the right direction. I have in my mind a successful engineer, who constructed two of the most important railroads in the West, whose only schooling

was on country turnpikes and as a County Surveyor.

What Philadelphian, whose recollection extends back over a period of fifty years, does not remember the streams of produce-loaded great Conestoga wagons, with their high, hooped white canvas covers or roofs, drawn by teams of four or six horses, that poured over the Lancaster pike into the city? These, in seasons of hard, dry roads, to avoid the payment of toll, came by way of the West Chester or other dirt roads, leaving in their wake for miles and miles clouds of almost impenetrable dust. These great wagons, backed to the curb on both sides of Market Street—the main thoroughfare of the city and one of its widest streets—their poles all slewed to an angle of some 45°, pointing in the same direction; the great feeding trough, that was carried hung on the back of the wagon, affixed on the pole, with horses on either side, feeding; turning many blocks of the main street into a horse stable, leaving scarce passing room for vehicles between this *Cheval-de-frise* of wagon poles. At that time, with the exception of the commerce on the rivers, the entire produce of the country and return merchandise was moved in road-wagons by horse-power.

The journey from Philadelphia to Pittsburgh in the fast mail coach was a fearful undertaking of three days and two nights. Six passengers were cramped in a coach, with mail pouches filling all proper leg room. Rather more comfort was to be had in the slower nine-passenger coach. The journey from New York to Washington was no mean undertaking, though, when navigation was open, it was greatly eased by the steamboat from New York to New Brunswick, and from Trenton to Philadelphia on the Delaware. This was called the Union, or Stevens and Stockton Line. At the time of strong competition between it and the Citizens', or Gibbons', Line—that ran steamboats from New York to South Amboy, stages to Bordentown, and boats from there to Philadelphia—the furious driving on the coaching part of the line in clouds of dust was fearful; but the distance from city to city was made by daylight. Now it is made by rail in two hours. From Philadelphia to Baltimore, by steamboat on Delaware to New Castle, from which place stage coaches had given place to four-wheel cars drawn by horses on a light strap rail on wooden stringers to Frenchtown, from there by steamboat to Baltimore, the time being about two hours longer than from New York to Philadelphia; the time from Baltimore to Washington by stage was about 3½ hours. This was summer travel; but in the winter, when the rivers were frozen, the entire distance had to be traveled in stage coaches. On one occasion, when this state of affairs existed, I was obliged to go from Philadelphia to Washington, and thought myself very fortunate to be of a party with Mr. Reside, the proprietor of the line, and at that time one of the largest mail contractors and stage line owners in the United States. He promised us a quick trip, with relays of his best teams, the hardest stage to be with six instead of four horses. We left Philadelphia an hour before daylight, in an open front coach on sleigh runners. The day was very cold, and before we reached Elkton, Md., a driving, blinding snowstorm set in, steadily increasing in violence. It was long after dark when we got to the Susquehannah, opposite Havre-de-Grace. The river was frozen, and had to be crossed on the ice. There were sleds to be pushed by men, or drawn by a single horse to a sled; these were to take over the mail, passengers, and baggage of the six coaches that had left Philadelphia in the morning. Of these, the Reside coach was the only one that had arrived. Some of the sled men refused to venture in the storm; all considered it dangerous. The road tracks were covered by the falling snow; gaping airholes were on every side; the night very dark, the driving snow blinding, and the only guide the sound of a constantly-tolling bell on the Havre-de-Grace side. Mr. Reside encouraged us to venture, and advised walking behind the sleds instead of riding on them. He had confidence in the men taking us safely over in this way. All but two passengers, who refused to go before daylight, started. When about midway of the river, the bell either stopped tolling, or its sound was carried by on the wind that had increased to almost a gale. Soon the sled pushers, that had kept well together, became confused and called a halt; then, by the dim light of poorly-constructed candle lanterns, they groped about, feeling with their hands in a vain hope of finding old tracks in the ice. They were evidently off of the road. Mr. Reside urged them to push on, offering to take the lead with only the direction of the fiercely-blowing northeast wind for his guide. No one of the party had a compass. The men, knowing the danger of the airholes, held back. "Then," said Reside, "stamp about and keep your blood circulating, or you will all freeze." He then sat down on a sled, pulled off one of his heavy boots, thrust into it some crumpled newspaper, and sheltering a lantern from the wind under his cloak, set fire to the paper. As it blazed he shook it about in the boot, which, when well heated, he pulled on to his foot; then went through the same operation for the other foot. Several of the party followed his example. It was a lesson that I have profited by several times since. His next move was to demolish a sled to make a fire, but before it was kindled the wind lulled, and we again heard the tolling of the bell. It was then evident that the pushers had got considerably off the track. By slow and cautious work they landed us safely. There was not a temperance member of that party who refused a hot whiskey punch of Reside's brewing, to brace and warm up while a hot supper was preparing. We afterwards learned that the rest of the stages had been stopped by the storm, and laid over for the night at Elkton. From Havre de-Grace to Baltimore in regular stage coach, arriving there after daylight, and Washington by noon—over thirty hours of hardship in accomplishing what is now done within five hours on the railroad, regardless of the seasons, with ease and comfort to the traveler. This is what the country owes to the labor and skill of its civil and mechanical engineers, backed by the capital of far-seeing men, who were to reap the profits from its accomplishment.

At the time I am writing of, Pittsburgh and Wheeling were great distributing centers for what was then considered a vast emigration to the Western Territories and new States. They were fast settling in and filling the valleys of the great rivers, the natural roadways. On reaching these places on the river their hardest labor was over. The keel boat, the flat, and the few steamboats then running were for those who had the means to use them, and those who had not, built for themselves small family boats, often not over 4′ or 5′ by 10′ or 12′, protected by bent poles and wagon covers from the weather. In this way thousands moved to their destined new homes. I have seen more than a score of these floating tents gliding down the stream, or tied up to the shore, by camp fires to cook their family meals, within a single reach of the crooked Ohio. The bulk of these emigrants had come from across the ocean. The most thrifty moved with wagons and teams, but a large portion, with a single horse attached to a crazy cart or wagon, and not infrequently a favorite cow, brought from the old country, in the shafts, did the duty of a horse in hauling the household goods, and occasionally a helping lift to the mother and her infant, all the rest of the family tramping on foot.

Thousands of acres of fertile land, for want of cheap modes of transportation to carry produce to market, had been passed by for the more accessible river bottoms, but on the opening of the Erie Canal much of this would be changed. It is the engineers and the works they constructed during this transition state, and that immediately following, that I now propose to refer to. But before doing so I will relate another incident of travel, as told me by the chief actor, to show the character of the men who migrated to the West, growing with its growth, but at all times keeping in advance and directing that growth. He came from the North of England, and was what, in my younger days, machinists called a Scotch millwright—a workman equally good on iron or wood work. He had located in Baltimore, obtained employment, and was thriving, having got many comforts of life around him, when his wife died, leaving to him an infant and three other young children. He had no relatives in this country to call on. He employed a widow as housekeeper and nurse; things moved smoothly for a few weeks; the children were becoming fond of her, when she told him that her living alone with him was a scandal in the neighborhood, and unless he married her she would be obliged to leave. He was prompt in saying "go." Another woman was tried, with the same result, but in shorter time; then a third, with the same old story over again. He wrote to England for his sister; she could not leave their mother, who was tottering on the verge of the grave. The first widow would drop in to sympathize and make herself useful to the children. One Sunday he made up his mind to take her for his wife, simply as a marriage of necessity for the children's sake. It was done at once, as he could not lose time from his work. On the following Saturday, on returning from his work, his week's wages in his pocket, he found the children crying, no supper prepared, his new wife, whiskey bottle in hand, on the floor in a drunken stupor. The neighbors came in to help him with the children, and to console him by telling him "that she always would take her sprees, but they never lasted much over a week, but as she had held off longer than they had ever known her to, this one might last longer." His mind was at once made up. He bought a porter's two-wheel hand-cart, loaded it with the children's clothes, some pillows, wraps and provisions, then packing in the children; including the infant, in the small hours of the night started on his long journey for the West. He left for his drunken wife half his money and all his household goods, took the National road, trundling before him his living load. All tavern keepers and farmers on the line of the road refused pay for provisions or nights' lodgings; passengers in passing stage coaches seeing so strange a rig, threw money to him. By the time he reached Washington, Pa., he was able to buy a horse and cart from a contractor then quitting work on the road. With this he continued his journey to one of the interior towns of Ohio. His skill in working either wood or iron soon got him profitable employment. He became a contractor for lock-gates on the canal, bridges and other works, and in time the builder and owner of extensive manufactories; and at the time he related the above he was an efficient and active director of a trunk line of railroad, in which he was a heavy stockholder. To my question if he "had ever heard of the wife he deserted?" the reply was, "Yes; the money and property he had left gave her the means of indulging in her strongest passion, and she soon took her final departure on the fast whiskey line."

A neat belt tightener has been patented by James W. Bixby, Athens, Me. He uses two crossbars that stand parallel, each grasping an end of the belt by means of cramping mechanism. Two screws that pass through the ends of the crossbars are operated to draw the ends of the belt together till the required tension is obtained.

The membership of the American Institute of Mining Engineers comprises 1,467 in all, according to the catalogue recently issued with Vol. XII of the transactions. The society is in a flourishing condition.

The British National Association for Promoting Technical Education has appointed a deputation to visit the continent of Europe, for the purpose of reporting upon the technical instruction given to the industrial classes in Germany, France, Switzerland, and elsewhere, and the influence of such instruction upon manufacturing and other industries at home and abroad.

Necessity of Trade With South America.

Rev. Dr. Talmage, the celebrated preacher of the Brooklyn Tabernacle, delivered a Thanksgiving sermon on American production and trade, a portion of which we give below. It will be noticed that he has a rather strained view of overproduction, but his ideas of the necessity and feasibility of a large export trade to South America are worth special attention:

"The prosperity of this country has rolled up until the crest of the wave has broken and recoiled upon itself. More corn and wheat and cotton and rice than we can find profitable market for. More manufactured goods than we can dispose of. The grain markets all glutted and the factories by scores stopping or run with only half the spindles harnessed, and wages are cut down in some places because the supply has swamped the demand, and nothing is the matter to-day with this country but overproduction and under-consumption. God snowed upon the track of this nation such vast accumulations of prosperity that the engine that draws the train can hardly plow through. The American nation is being choked to death with surplus of production and manufacture, and from the numbers of excellent men in my own profession without settlements, some might think too many ministers. The deluge of supply has risen fifteen cubits higher than the mountains of demand. The load of national wealth is so great that the team cannot draw it. The man who dies for lack of a crust of bread is no worse off than the man who is smothered to death in a wheat bin. The nation suffers to-day, not from marasmus, but from plethora; not from consumption, but from threatened apoplexy. What shall we do? 'Let us rush right down to Washington and have the tariff changed,' say a great multitude. But put up the tariff as high as Tip-top House on Mount Washington, and while you might keep out foreign goods we have enough materials of our own left to weave ten woolen shirts where there is one back to wear them, and make ten pairs of shoes for every two feet that need them, and twenty curtains for every window that could support them, and twenty pairs of eyeglasses for every vision that might be reinforced by them. Doctor the tariff with homœpathic or allopathic or eclectic dose from now until the Thanksgiving day of the year 2,000 and you cannot in that way cure this chronic malady. Others hope by change of national administration to correct the trouble, but no President, though he had the combined patriotism of Washington, and the broad views of Jefferson, and the suavity of a Madison, and the courage of an Andrew Jackson, and the old fashioned honesty of an Abraham Lincoln could regulate the inexorable law of supply and demand. No President could do it. Well, some say, 'Let us pack up our trunks and move East, or North, or West.' Going east toward Europe would be exodus into starvation. The avalanche of population assures us that those continents are overcrowded. We all know that this is the best country in all the world to live in. I have 850,000 fresh reasons for saying so. Eight hundred and fifty thousand people coming from other shores to live in America. If America had not been the best place to live there would have been 850,000 Americans going to Europe. Shall we go North? Already the busiest hives of competition are along the St. Lawrence, Androscoggin, and Penobscot, and the voices of the woods of Maine and the forests of the lake chain answer, 'No room here.' Shall we move West? There is no West. The emigrants chased it across the Ohio, across the Mississippi, across the La Platte, and the Fremont exploring expedition put their spurs into the horses' flanks and chased the West from the Rocky Mountains to the Sierra Nevadas, and the forty-niners from California, landing from the ships on the Pacific beach, attacked the West in the rear, and the workmen of the Union Pacific, Northern Pacific and Southern Pacific railroads came upon it with their spades, and the giant West has ceased, and though some might say of it as

was said in regard to Moses, 'No man knoweth of his sepulcher to this day,' I think the Yosemite Valley is its sarcophagus, with El Capitan for the headstone and Cathedral Rock for the footstone. Millions of foreign population that are yet to cross the sea for America will soon enough fill all the area between Atlantic and Pacific beaches. But in the words of my text I now declare 'another door toward the south—on the south three gates.' When I say south, I do not mean the Southern States of our own American Union, but I mean the magnificent infinity of opportunity beyond, Portuguese America and fifteen Spanish American republics and the islands of the South Pacific. Through that door will come the complete and glorious relief for all this over supply. It will come within ten years, within five, within three; on the 16th of next month, at the New Orleans Exposition, that door will begin to swing open, and if the Government of the United States fully appreciates the opportunity, and the people of this country will help, the highest water mark that the wave of our national prosperity has ever reached will be 100 feet under what shall speedily be the full tide of commercial, agricultural, manufacturing, literary and moral success. In the name of God, I proclaim revolution, not by sword, or dynamite, or nitro-glycerine, or giant powder, but by the plow, and saw, and yard-stick, and factory band, and new lines of steamers, and whole nations rising up to greet our nation in commercial amity. Our people for the most part sit in appalling ignorance of an opportunity such as was never spread out before any nation since the morning stars sang together. The simple fact is that the vast realms of population in the tropics are buying from transatlantic nations almost everything, and from us almost nothing, and the tide ought to turn, and the tide will turn, and I preach this sermon to help it turn. Your ears will tingle with the intensity of this recital: In 1880, $5,369.000,000 worth of goods manufactured in the United States, and only two per cent. taken by foreign markets. I say that over again. In 1880, $5,369,000,000 worth of goods manufactured in the United States, and only two per cent. taken by foreign markets. Is it not a marvel that American manufactures are not as dead as the proverbial door nail? My only wonder is that nine-tenths of the manufacturers have not gone into bankruptcy and ninety-nine one hundredths of the factory hands have not gone into starvation or the almshouse, and it will be worse if the battle is to go on between Lowell spindles here and Manchester spindles there, between foreign merchants who want tariffs down and American merchants who want tariffs up. There is no relief for us in the markets of Europe, and there will be none until

'Moons shall wax and wane no more.'

This nation to-day is like a silly dry goods merchant who stands behind the counter haggling with a small customer about three yards of tape when there are at the counter impatiently waiting three princesses wishing to purchase three bridal *trousseaux*. On the South of us are regions nearly three times as large as the United States without manufactories, without woolen goods, without agricultural implements, without telegraphs, without telephones, without shoes, without sewing machines, without 10,000 things that we have and they must have. Not tens of thousands but millions of consumers. Where shall they get their supplies? They are getting them from another hemisphere 3,000 miles away, and we at their next door are buried under a surplus of these very things. They are able to trade with us for their sugars and coffees, and spices and fruits and valuable woods, and a thousand other commodities we need as much as they need our products. But look and then hang your heads at the statement, that while our next door neighbors the southern republics, and Brazil and neighboring colonies import $675,000,000 worth of goods a year, only $126,000,000 are from the United States—$126,000,000 out of $675,000,000. Only one-fifth of the trade ours. European nations taking their four fingers, and leaving us the poor thumb. The sister republics on the American continents with a foreign commerce amounting to $428,000,000 trade with us to the feeble and paltry sum of $63,000,000. Much of the $106,500,000 yearly expended by Americans in Europe will be expended in Southern explorations, in looking up the ruins of the forty-seven cities which Stephens, the traveler, found only a little way apart, and walking through the corridors, and under the arches, and in the great doorways, and over the miracles of mosaic, and along by the monumental glories of another civilization, and ancient America will with cold lips of stone kiss the warm lips of modern America, and to have seen the Andes and Popocatapetl will be deemed as important as to have seen the Alpine and Balkan ranges. So there will be fewer people spoiled by foreign travel, and in our midst there will be less poor and nauseating imitation of the French shrug, and the intentional hesitancy of a brainless foreign swell. The fact is there are more people made fools of by European travel than in any other way, and though sensible when they embark, they return with a collar, and a cravat, and a shoe, and a coat, and a pronunciation, and a contempt for American institutions, and a bend of the elbow that makes one believe in evolution backward from man to ape! Of the 30,000 Americans who now cross the sea annually, thousands will on pleasure and business visit the tropics, and so tourists and merchants and scientists and capitalists will all help in this national development. I wish that somehow our next Congress might take the $100,000,000 of surplus in the United States Treasury, which the Republicans did not steal, and before the Democrats get a chance to steal it, and in some way expend it in establishing a new line of shipping between the ports of North and South America, and in dredging their harbors, and in building telegraph lines, and in the quickening of that glorious consummation which is sure to come. I want it to come very soon. I want it to come before there is any more suffering. I want it to come before there is any more sorrow. Go on, gentlemen, discussing your high tariff and low tariff, and horizontal tariff, and no tariff at all, until the questions are as stale and malodorous as the mossbunkers which the Long Island fishermen throw on the field to enrich their farms. But meanwhile God is going to appear for the rescue of the multitudes of hardworking men and women of this country who have been hungry and cold long enough. And this door of the South, opened, is going to let in on them a summer of light and glorious prosperity. I believe it just as certainly as I stand here. In anticipation I nail on the front door of the nation an advertisement:

"Wanted, 100,000 men to build South American railroads as long as from here to San Francisco.

"Wanted, 5,000 telegraph operators.

"Wanted, $20,000,000 worth of drygoods and hardware from New York City."

Mr. Frank C. Smith has accepted the position of superintendent of the Locomotive Improvement Company at Toledo, O. The company rent locomotives, and manufacture a traction device, and other railroad appliances.

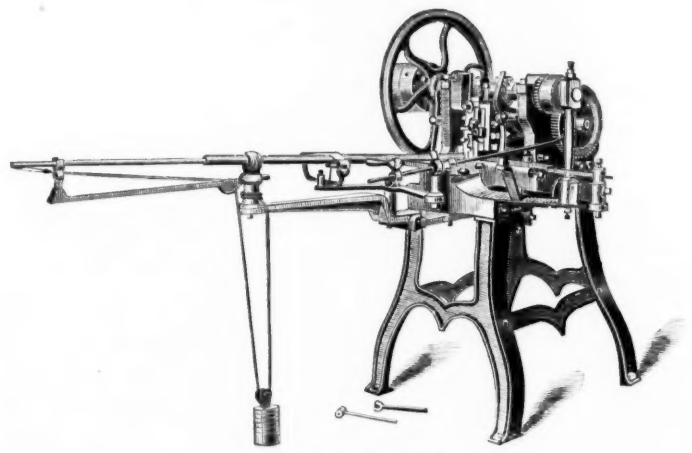
New Tack Machine.

With the engraving we represent a new Blanchard tack machine, made by the Wilets Manufacturing Company, Providence, R. I.

The general construction of this machine is similar to a nail machine, but differs in some of its important details.

The moving jaw that carries the cutter in a nail machine is made in one solid piece, while in this machine it is made in two parts, and provided with two cutters, operated by two cams on the shaft. In making the downward stroke, the two cutters move as one until the tack is cut; then one of them stops, and the other (which has a cutter just wide enough to cut that part of the tack that makes the head) continues to move down, and, by the aid of a finger that comes up under the cutter, carries the tack downward to the gripping dies, which grip it as soon as it arrives in the right position. The cutter and finger then return for another stroke, and make room for the header to come up and finish the tack. The header derives its motion from the crank and connection on the right-hand side of machine, as seen in the engraving. The lower end of the connection is fitted with an accurately-made ball-and-socket joint. This does away with any tendency to cramp or bind.

As soon as the header leaves the tack, the gripping dies release it, and it falls into a pan under the machine. Sometimes the tack sticks in the dies. To prevent this, a suitable cleaver is provided. It has an automatic feed, obtained by means of a weight and cord attached to the nipper-rod. The reverse motion is obtained by means of a fiddle-bow arrangement; this turns the barrel through which the strip of plate is fed.



NEW TACK MACHINE.

The working parts are all made interchangeable. The cutting and gripping levers, as well as the header, are fitted with bronze boxes, which pivot on cast-steel centers, carefully hardened.

An important feature of this machine is the uniform size of the bolt-heads and set screws. These are all made $\frac{5}{8}''$ square, which does away with the necessity of different sized wrenches.

This machine will cut all the different styles and sizes of tacks in use. It will also make clout nails and small fine nails.

The machine is a strong one, and is made with an eye to durability.

It will produce from 220 to 250 tacks per minute, according to the size.

Weight of machine, 1,900 lbs.

Improvement in Cable Roads.

A. H. Mathesius, the engineer who superintended the construction and erection of the traction machinery of the Brooklyn Bridge, and who has had extended experience in cable propulsion, has worked out a new arrangement for this purpose, for use on surface roads, which he believes will reduce the first cost of construction from $60,000 to not more than $10,000 per mile. At present the trough in which the cable runs is from 30 to 48 inches in depth, the gripping device being operated in this trough, which is constantly exposed to being filled with dirt and snow. To get this trough in position requires a general tearing up of the road, and the usual obstructions of water, gas and sewer pipes are met with.

Mr. Mathesius' plan provides for using a 6" covered pipe, which will go top of the front cross ties, requiring to put in place, simply removing the pavement at the center between the tracks.

The gripping device works outside the tube. As the car moves along it uncovers the tube at the front end of the car and covers it at the rear, leaving only the part of the tube that may be under the car uncovered. By his arrangement curves of 45 feet radius can be made.

The Waldumer Electro-Magnetic Brake.

At the time the Chicago Exposition of Railway Appliances was going on, we called attention to the Waldumer Electro-Magnetic Brake which was exhibited there, and expressed the belief that it was a most valuable invention. We now learn from letters published in the *Railway Review*, and by a private letter from Mr. Goss, Superintendent of the Company, that the brake is doing excellent service on the Cincinnati, Washington & Baltimore division of the Baltimore & Ohio Railroad. The brake is automatic and possesses every valuable feature of the best air and vacuum brakes, besides several important advantages of its own.

During a public trial at which several prominent railroad officials were present, a train of coal cars and a caboose fitted with the brake were tried. During a run down a grade of 68 feet to the mile, the brake was applied, when a speed of 48 miles an hour was reached, and it stopped the train in $37\frac{1}{2}$ seconds in a distance of 445 yards. The application of the brake to the wheels was prompt, and the pressure uniform, there being no closing up of the rear cars or any jerking of the couplings. The brake will be specially valuable for holding trains down long grades, as the power can be maintained uniform without the necessity for releasing to reinforce the pressure.

The Kings County Association of Practical Engineers and Machinists have issued the following circular explaining the purposes of their organization:

This Association is composed of practical mechanics, residing in the limits of Kings County, its object being the intellectual advancement of its members and the establishment of a library for the use of its members. We hope to secure a permanent hall, where we can hold meetings. It is also our intention to have lectures delivered by practical tradesmen with blackboard illustrations. None but practical men will be admitted to membership. Our main object is to build up the trade, so that none but good and reliable men may hold positions in our many shops, factories, etc. We invite all practical men to join us as active members, as it will be, we think, of great benefit to them. We would also call the attention of all employers to our organization, and respectfully state that any desiring to do so may become honorary members. Our central office will be Nos. 50 and 52 Myrtle Avenue. All communications addressed to us at the above place will be promptly attended to. All employers are respectfully requested to call upon us and see for themselves, as their presence will no doubt be encouraging to our members, and tend to make our organization a success.

We discountenance all strikes.

The Association will meet for the present at Heiser's Assembly Rooms, 136 Broadway, Brooklyn, E. D., every Tuesday evening, at 8 P.M., for the purpose of receiving new members, until further notice is given.

Yours respectfully,

JAMES CANNING, President.

WALTER L. SCOTT, Secretary.

For a "dull year," the number of railway enterprises, some of them of great importance, recently commenced or projected is remarkable. Railways could never be built and equipped as cheaply as now, and the next year is likely to see a large number of new lines under construction.—*Railway Age.*

Table of Sizes of Chimneys.

A PAPER READ BEFORE THE "AMERICAN SOCIETY OF MECHANICAL ENGINEERS."

BY WILLIAM KENT, OF NEW YORK.

The accompanying table of sizes of chimneys for various horse-powers of boilers is based on the following data:

1. The draft power of the chimney varies as the square root of the height.

2. The retarding of the ascending gases by friction may be considered as equivalent to a diminution of the area of the chimney, or to a lining of the chimney by a layer of gas which has no velocity. The thickness of this lining is assumed to be two inches for all chimneys, or the diminution of area equal to the perimeter × two inches (neglecting the overlapping of the corners of the lining). Expressed algebraically, let D = diameter, A = area, E = effective area.

For square chimneys, $E = D^2 - \frac{8D}{12} = A - \frac{2}{3}\sqrt{A}$.

For round chimneys, $E = \pi\left(D^2 - \frac{8D}{12}\right) = A - 0.592\sqrt{A}$

For simplifying calculations, the co-efficient of $\sqrt{A}$ may be taken as 0.6 for both square and round chimneys, and the formula becomes

$$E = A - 0.6\sqrt{A}.$$

3. The power varies directly as this effective area E.

4. A chimney 80 feet high, 42″ diameter, has been found to be sufficient to cause a rate of combustion of 120 pounds of coal per hour per square foot of area of chimney, or, if the grate area is to the chimney area as 8 to 1, a combustion of 15 pounds of coal per square foot of grate per hour. This is fair practice for a boiler of modern type, in which flues, or tubes, are of moderate diameter, gas passages circuitous, and heating surface extensive in proportion to rate of combustion, so as to cool the chimney gases to 400° or 500°, and produce high economy.

5. A chimney should be proportioned so as to be capable of giving sufficient draft to cause the boiler to develop much more than its rated power, in case of emergencies, or to cause the combustion of 5 pounds of fuel per rated horse-power of boiler per hour.

Conditions 4 and 5 being assumed, the 80′x42″ chimney, 9.62 square feet area, will cause the combustion of 9.62x120 = 1154.4 pounds of coal per hour, or at 5 pounds of coal per horse-power per hour, is rightly proportioned for 231 horse-power of boilers.

The power of the chimney varying directly as the effective area, E, and as the square root of the height, h, the formula for horse-power of boiler for a given size of chimney will take the form:

H.P. $= CE\sqrt{h}$, in which C is a constant.

For the 80′x42″ chimney,

$E = A - 0.6\sqrt{A} = 7.76$ square feet.

$\sqrt{h} = 8.944$ square feet.

Substituting these values in the formula it becomes:

$$231 = C \times 7.76 \times 8.944,$$

whence $C = 3.33$,

and the formula for horse-power is

H.P. $= 3.33\ E\sqrt{h}$, or, H.P. $= 3.33\ (A - .6\sqrt{A})\sqrt{h}$.

If the horse-power of boiler is given, to find the size of chimney, the height being assumed,

$$E = \frac{0.3 \text{ H.P.}}{\sqrt{h}}$$

For round chimneys, diameter of chimney = diameter of $E + 4''$.

For square chimneys, side of chimney = $\sqrt{E} + 4''$.

In the formulæ and table no account has been taken of the difference which is believed by some authorities to exist in the efficiencies of round and square chimneys of equal area, nor of the differences of friction and of rate of cooling of the gases in iron and in brick chimneys. Should experimental data of these differences, or of the effect of infiltration of air into brick chimneys, be obtained in future, the formulæ and table may be corrected accordingly.

SIZES OF CHIMNEYS FOR STEAM BOILERS.

Formula, H.P. $= 3.33\ (A - 0.6\sqrt{A})\sqrt{h}$.

Diameter, inches.	Area A. Square feet.	Effective Area. $E = A - 0.6\sqrt{A}$. Sq. feet.	HEIGHT OF CHIMNEY. COMMERCIAL HORSE-POWER OF BOILERS. 50 ft.	60 ft.	70 ft.	80 ft.	90 ft.	100 ft.	110 ft.	125 ft.	150 ft.	175 ft.	200 ft.	Equivalent Sq. Chimney. Side of square $\sqrt{E} + 4$ inches.
18	1.77	.97	23	25	27	.....	.....	.....	.....	.....	.....	.....	.....	16
21	2.41	1.47	35	38	41	.....	.....	.....	.....	.....	.....	.....	.....	19
24	3.14	2.08	49	54	58	62	.....	.....	.....	.....	.....	.....	.....	22
27	3.98	2.78	65	72	78	83	.....	.....	.....	.....	.....	.....	.....	24
30	4.91	3.58	84	92	100	107	113	.....	.....	.....	.....	.....	.....	27
33	5.94	4.48	.....	115	125	133	141	.....	.....	.....	.....	.....	.....	30
36	7.07	5.47	.....	141	152	163	173	182	.....	.....	.....	.....	.....	32
39	8.30	6.57	.....	.....	183	196	208	219	.....	.....	.....	.....	.....	35
42	9.62	7.76	.....	.....	216	231	245	258	271	.....	.....	.....	.....	38
48	12.57	10.44	.....	.....	.....	311	330	348	365	389	.....	.....	.....	43
54	15.90	13.51	.....	.....	.....	.....	427	449	472	503	551	.....	.....	48
60	19.64	16.98	.....	.....	.....	.....	536	565	593	632	692	748	.....	54
66	23.76	20.83	.....	.....	.....	.....	.....	694	728	776	849	918	981	59
72	28.27	25.08	.....	.....	.....	.....	.....	835	876	934	1023	1105	1181	64
78	33.18	29.73	.....	.....	.....	.....	.....	.....	1038	1107	1212	1310	1400	70
84	38.48	34.76	.....	.....	.....	.....	.....	.....	1214	1294	1418	1531	1637	75
90	44.18	40.19	.....	.....	.....	.....	.....	.....	.....	1496	1639	1770	1893	80
96	50.27	46.01	.....	.....	.....	.....	.....	.....	.....	.....	1876	2027	2167	86

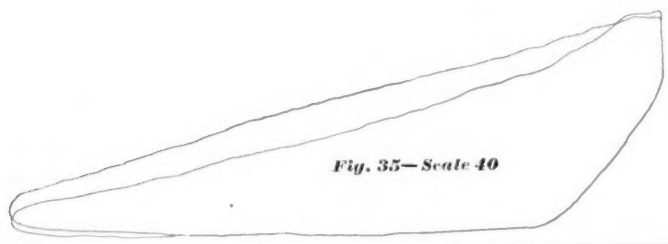


Fig. 35—Scale 40

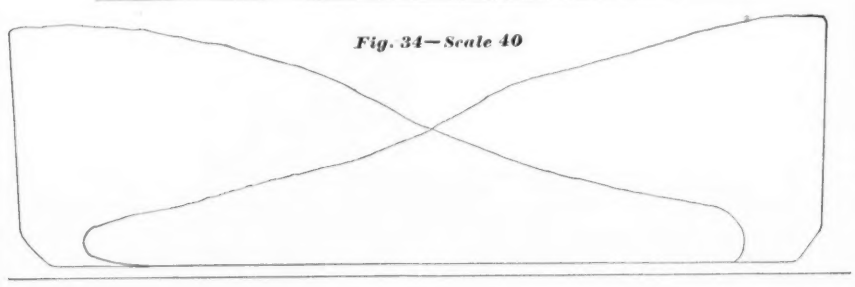


Fig. 34—Scale 40

The Indicator Diagram.

BY F. F. HEMENWAY.

The diagrams represented in Figs. 34 and 35 were received with request for opinions and advice. Those in Fig. 34 were taken from a 26½″x30″ upright engine, running at a speed of 76 revolutions per minute. The engine has caused a good deal of trouble from heating and pounding, and considerable expense has been incurred in overhauling, but to no purpose. The eccentric has been shifted to change the lead from 0 up to ⅜″, but the engine cannot be made to run quietly. An 8-ton fly-wheel is used.

The writer asks if setting the eccentric back, so steam will not be admitted to the cylinder until a little after the beginning of the stroke, will stop the pounding. This is easily tried, but the diagrams give no evidence that it will be effective. I should infer that the engine was fitted with a supplemental cut-off, probably riding on the back of the main valve, and that like most engines of this type—for obvious reasons—the main valve had but little outside lap; also that, to guard against back pressure, there was little or no inside lap. This lack of inside lap is right enough if the engine will run quietly without it, but that is seldom the case. This is especially true of vertical engines, which, under these conditions, will seldom get by the lower center without a good deal of noise. To remedy this, more compression must be had. Looking at the compression curves on these diagrams, it will be seen that they reach to only about seven or eight pounds above atmosphere, while the pressure on the other side at release, or exhaust opening, is about fifteen pounds.

Referring to Fig. 35, the compression, compared with 34, begins earlier in the return stroke, and is carried to a pressure of 35 pounds above atmosphere. If the compression curves of the diagrams in Fig. 34 were similar to that in Fig. 35, the engine would, in all probability, run quietly. The compression then being materially higher than the steam pressure at release, somewhere along the compression curve, before the end of the stroke in one direction, the pressure resisting the motion of the piston would gradually become equal to and then greater than the pressure impelling it. This would quietly take up lost motion in the opposite direction from that in which the piston was moving, so that when steam was admitted for the return stroke there would be nothing to produce a jar or shock.

Undoubtedly, the construction of the engine from which diagram 34 was taken is such that the amount of compression shown in 35 cannot be had. But it can be approximated. To do this, add inside lap to the valve. Thus, assuming the outside lap to be ½″, add inside lap of ⅜″, or even $\frac{7}{16}$″. This will probably slightly increase the back pressure, but it is better to submit to a slight loss from this than to submit to the loss and danger from pounding. Adding inside lap, as suggested, will probably raise the compression curve above the pressure at release, and at this speed, if only a few pounds higher, it will serve the desired purpose.

Failure to state the boiler pressure makes it impossible to tell how near that pressure is realized in the cylinder. The back pressure is small, a consideration of which fact leads to the belief that inside lap can be added without seriously increasing the back pressure. (The engraver, from lack of distinctiveness in this respect, has located the atmospheric line about 1½ lbs. too low.)

Fig. 35 is from a 20″x24″ plain slide-valve engine. The steam pipe is 4″, with six elbows; governor, 5″; boiler pressure, 80 pounds. The writer who sends this diagram simply asks an opinion of it. If it fairly represents the load under which the engine is worked, it is, under the circumstances, very good. The load is too light for the best economy, but, if it was very materially increased, the steam pipe should be larger, or there would probably be trouble with the regulation. As it is, by means of initial expansion a diagram representing good economy is produced.

Engines of the United States Steamer Atlanta.

The engine of the Atlanta is nearly completed, and is erected in the machine shop of the Morgan Iron Works, New York city. Owing to the necessity for crowding engines belonging to naval steamers down below the water line within limited space, symmetry of design has generally to be sacrificed to the contracted surroundings. This engine is no exception to the naval rule, and some parts about it appear anomalous to the engineer accustomed to the appearance of current mercantile marine engines. The engine is of the three-cylinder horizontal, back-acting compound type. The most striking impression made on first examining the engine is the shortness of stroke in proportion to the diameter of the cylinders. This is especially conspicuous in the low-pressure cylinders which look like metallic vats. The high-pressure cylinder is 54 inches diameter, and the two low-pressure cylinders are 74 inches diameter, the stroke of all being 42 inches. The cylinders are all provided with steam-jackets, and each has two main slide valves with double ports, and two cut-off valves that work on the back of the main valves. All the valves are made of the best cast iron. To operate the valves eccentrics and a shifting link are used. The eccentrics are substantial disks of cast steel, made in two parts, and the straps are of a composition metal resembling brass, but said to have elements that make the metal very strong. The piston heads and followers are also made of this metal, but the packing consists of two cast-iron rings. Every part about the engine appears to be of excellent material, and the workmanship is certainly first-class.

Adhere to Mechanical Standards.

We have received the following circular for publication from the secretary of the Master Car Builders' Association:

"*To the Members of the Master Car Builders' Association:*

"Your attention is called to the list of standard dimensions, forms of construction, etc., which have been recommended by your association, and which will be found on pages 166 to 180 of the Eighteenth Annual Report, a copy of which is sent herewith. At the last convention the previous action of the association with reference to standards was carefully revised, and a number of errors and discrepancies were then rectified. The needed corrections have been made in the list referred to, which includes all the standards that the association has thus far recommended, and it is hoped that members who have not already adopted any or all of them will do so as early as possible.

"It is also of very great importance that those who are under the impression that they are using the dimensions and forms of construction which have been prescribed by the association, should compare their practice

with the descriptions of the standards as published in the list referred to, and in plates VIII. to XII., appended to the report. If such comparisons are made, there is reason for believing that very material differences may, in some cases, be found between the dimensions of the parts in use and those specified by the association. All who think that the journal bearings and boxes which they are using are in accordance with the Master Car Builders' standard, are advised to compare their patterns with plates X. and XI. In some instances, when this has been done, the discrepancies and differences in size have been found to be so great that what were nominally standard bearings of one road would not interchange with those used on another. The same thing is often true of screw threads, and the attention of members is, in this connection, called to the resolution on page 169 of the Annual Report.

"One of the main objects which the association aims to accomplish is 'to bring about uniformity and interchangeability in the parts of railroad cars.' This end will be defeated if members either knowingly or ignorantly depart from or attempt to 'improve' the standards or make alterations in them. An axle which is one-half inch longer or shorter than the length which the association has recommended, is no more a standard than a yard-stick would be which was that much too long or too short.

"M. N. FORNEY, Secretary.

"LEANDER GAREY, President."

LETTERS FROM PRACTICAL MEN.

The Eufaula Boiler Explosion.

Editor American Machinist:

In the AMERICAN MACHINIST of Aug. 16th I gave an account of a large cotton, compress erected in Columbus Ga., by the Central R.R. and Banking Company. About the same time this company erected and started a similar press in Eufaula, Ala., using to furnish steam two machine-made boilers, 50″ diameter and 22 feet long; 14 six-inch expanded and beaded flues in each; manufactured in Ohio. These boilers were of homogeneous steel; shell $\frac{85}{100}$″ thick, and 55,000 tensile strength; heads $\frac{3}{8}$″ thick. About one month after the compress had commenced pressing cotton one of these boilers exploded with terrific effect. Besides eight men killed and a number crippled, the loss by fire in press, buildings, cotton and cars amounted to $125,000.

Through the kindness of Capt. Samuel J. Whiteside, President of the Central Cotton Press Association, I am able to present photographic views of exploded boiler, from which I trust you will be able to make engravings. These photographs were taken to be used, if necessary, in a suit for damages.

Fig. 1 shows the first sheet and front head of the boiler. It will be seen that only six rivets were left in the whole sheet. On head and sheet are shown the rivet holes where the stays were fastened to strengthen the head.

The rivets show a wedge-shaped fin in the center between the plates made by the rivets shaving down when the sheets were riveted together. Fig. 3 is the back end and side view of the boiler, lying the reverse way from which it flew.

At the time of the explosion there was a man on top of the boiler putting on an asbestos covering. This portion of the boiler was blown through the back wall to a distance of 302 yards, plowing a trench in the ground about three feet deep. It turned over and landed about fifty feet further on. The body of the man mentioned was found where the boiler first struck the ground.

Fig. 4 is a view of the front end of the boiler, where it was torn apart.

The wreck has been cleared away, new buildings erected, and a new compress replaces the old one. Steam will be furnished by a battery of three steel boilers 48″ dia. by 20′ long, 30 four-inch flues in each, hand-made shell $\frac{26}{100}$ thick, tensile strength 70,000 lbs.; heads $\frac{5}{8}$″ thick, and all made by Hussey Howe & Co., of Pittsburgh, Pa. The boilers will be manufactured at Pittsburgh, and tested to 280 lbs. hydraulic pressure.

Immediately after the boiler explosion at Eufaula the boilers in the Columbus compress were taken out and shipped back to the firm that made them, and replaced with a battery, same as the last-described boilers. When these boilers were taken out they leaked at all the seams, the fins on the rivets between the sheets holding them apart, the sheets being caulked so that they looked to be about $\frac{5}{8}$″ thick.

ROBERT E. MASTERS.

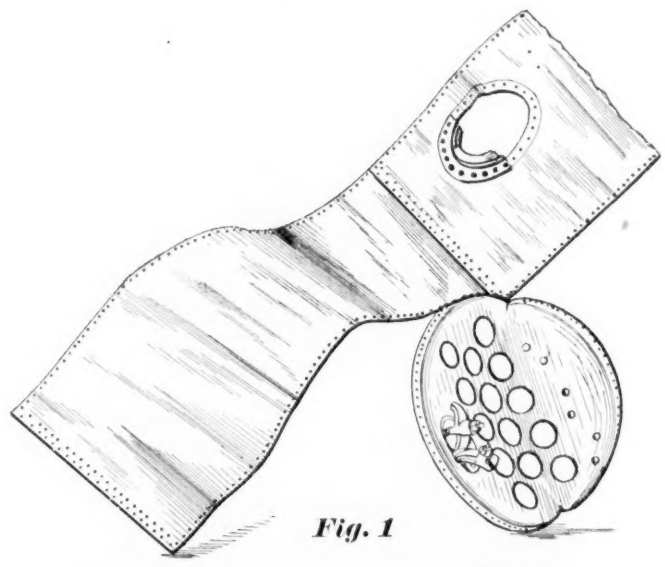


Fig. 1

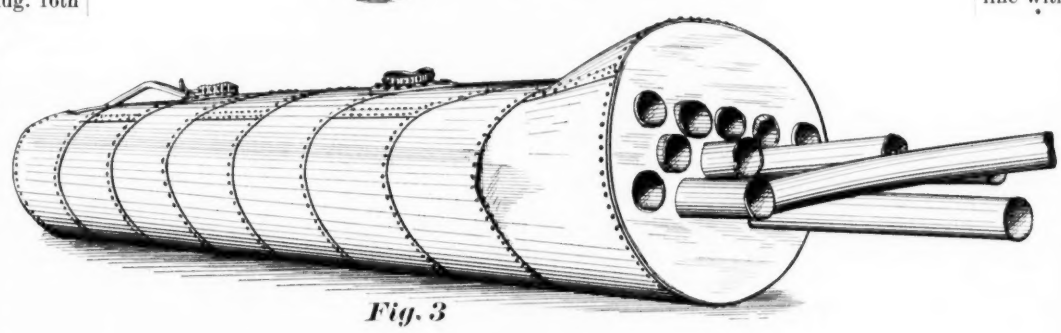


Fig. 3

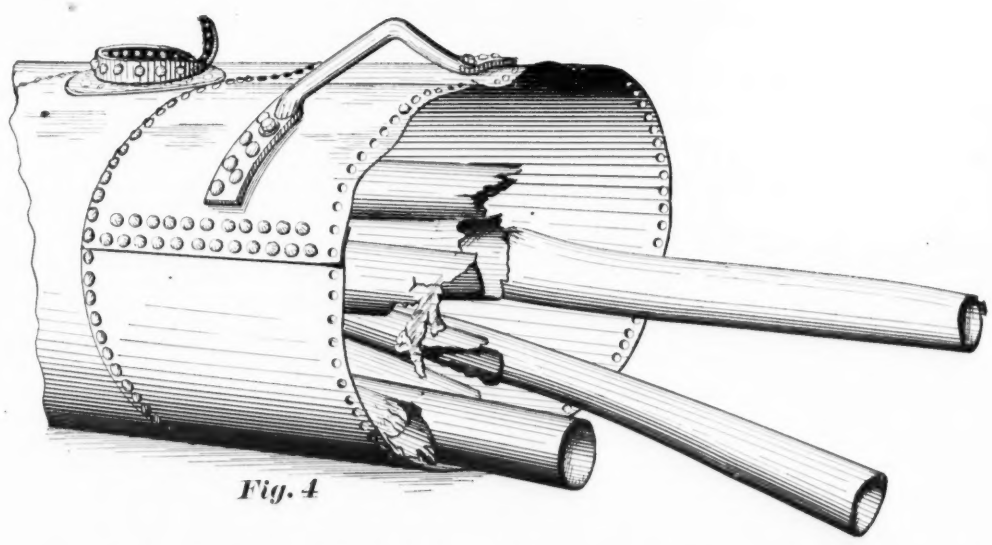


Fig. 4

The Manufacture of Plush at Seymour, Conn.

Editor American Machinist:

I had the pleasure, a few weeks ago, of looking through the plush manufactory at Seymour, Conn., through the courtesy of the president of the company, Mr. J. H. Tingue, and under the guidance of Mr. Copeland, the superintendent, whose inventive turn of mind, backed up by his indomitable perseverance and exceptional executive ability, have accomplished wonders in the past four years. Indeed, to pass through the different departments, as I did, and listen to the explanation of differences between the methods and machinery employed by the Tingue Company, and those employed by manufacturers of similar goods both here and in foreign countries, with the advantages claimed both in quantity and quality of production, and be told that the machinery had been invented, designed and built by themselves, while to the question, "How long has it taken?" came the answer, "Four years," was to me a genuine surprise. To the enterprise, perseverance, inventive and mechanical ability which have left their imprint all through this truly model establishment, I feel that I have no words in which to pay a fitting tribute. Through the successful establishment of this industry—the manufacture of mohair plush—is opened up a new and profitable industry in the raising of the Angora goat, which has already been found to be a sure source of profit in some parts of the Southern States, where sheep-raising had proved a failure.

The beautiful silky fleeces of these animals, with a fiber of six or seven to nine or ten inches long, and in extreme cases, I am told, it is found eighteen inches in length, are, by the ingenious machinery of the Tingue Company, carried from one stage of manufacture to another till two sheets of plush in one, joined by the pile of each, await the services of the ingenious splitting machine of Mr. Copeland, who, with the inspiration of American air, for the past score of years could not be satisfied with the old way in use abroad of weaving over wires, which, by withdrawing, cut the pile and separated the two sheets, but has invented a machine the office of which is to split in the most accurate manner, and in an entirely automatic way, any width or length of plush goods.

Not only is the operation of splitting performed automatically, but the knives which do the work are automatically ground while working, and so kept constantly sharp. Enough might be said of this place to fill a volume, but, wishing to be careful not to violate any confidence, I have simply to say that for the solid enjoyment I experienced in my visit, and the courtesy extended, I am truly grateful, while I feel—and I think that every American citizen should—that many thanks are due to these pioneers in an industry which promises to become one of great importance, not simply in a manufacturing sense, but to the land-owner in a large section of the country.

S. W. GOODYEAR.

A Standard for Bolt Holes in Pipe Flanges Wanted.

Editor American Machinist:

I would like some of your intelligent correspondents to suggest a table of standard diameters of circles on which to drill bolt holes in flanges, as it appears at present there is no fixed rule for drilling, and the result is that you will find flanges drilled at various distances from the center, causing a great amount of confusion and uncertainty, especially in flanges for connecting pipes.

If a certain rule were adopted by all manufacturers of pipe flanges, a vast deal of time would be saved. A. W. CADMAN.

Fitting Bolts in Flange Couplings.

Editor American Machinist:

Marshall and I have been comparing notes about the fitting of bolts in flange couplings for mill shafting, and we have agreed that for our use we do not want driving fits. Hand loose bolts will draw the flanges certainly as tightly together as will driven bolts, and I never knew a coupling bolt to shear off when the flanges were well drawn together.

In drilling and reaming bolt holes there is no certainty that they will all be perfectly in line with each other, or with the bore of the coupling, and the forcing together over diverging bolts, as is often the case in driven fits, is liable to spring the flanges or the shafting and make them run with a jump.

OLD JOUR.

Tendency of Curved Tubes to Straighten.

Editor American Machinist:

When reading the correspondence of Mr. A. F. Nagle, November 29th, I was disposed to disagree with his assertion, as the explanation I had received of the tendency of curved tubes to straighten themselves, was that the pressure on the outer half of the tube was greater than that on the inner half, owing to the greater surface, and I had intended to express myself to this effect. By a closer examination I found, however, that I could not fully prove my point, as opposite pressure seemed to neutralize the effect of this difference. Your correspondent, "Six H," (Dec. 13) however, is right when he says that if a closed vessel of any shape be submitted to internal pressure, its sides will tend to assume such outline as will allow them to enclose the greatest cubical capacity; but he is in error if he means to say that a tube of circular section will contain more when its center line is straight than when the same is curvilinear or circular. The golden rule for calculating cubical contents of bodies of rotation says, that the contents of a curved tube of circular section is equal to the area of its section multiplied into the length of its center-line, and as the same rule applies to straight cylinders it is evident that Mr. Nagle is right. The bending of a cylindrical hose is invariably attended by a flattening of the cross-section, and will therefore not answer as an argument against the assertion. Mr. Nagle's correspondence has indeed induced me to change my former opinion. HUGO BILGRAM.

Philadelphia, Pa.

It is stated that delicate pieces of steel may be successfully tempered by cooling in crude paraffine.

Some weeks ago Robert T. Porter, who had been traveling extensively in England, gave the following comparative rates of wages in shipbuilding to the *Philadelphia Press:*

Occupations and Allied Branches of Labor.	Per Week in Glasgow.	Per Week in Phila.
Foremen (men)	$10.00	$30.00
Platers (men)	7.50	18.00
Fitters (men)	7.50	15.00
Fitters' slippers	5.00	9.00
Drillers	6.00	10.50
Hole cutters	5.00	9.00
Riveters	5.00	12.00
Angle-iron smiths	5.00	14.00
Shipsmiths	5.00	18.00
Shipsmiths' strikers	4.50	9.00
Forgemen	4.50	9.00
Holders-up	4.25	9.00
Caulkers and chippers	7.50	12.00
Ship carpenters	7.75	18.00
Joiners	7.25	15.00
Joiners' laborers	4.25	6.25
Riggers	4.80	11.00
Riggers' laborers	4.25	9.50
Painters	5.00	15.00
Engineers	5.75	12.00
Laborers	4.10	6.75

The Standard Revolution Counter.

The advantages of being able to determine exactly the revolutions of shafting and machinery are well understood by manufacturers and workmen.

In some establishments, where piecework is the rule, the price paid for labor is based upon the number of revolutions the machines can be run at, and a good counter for this purpose is important. In indicating steam engines it is also very essential to know with certainty the revolutions made.

The full size engraving of a new revolution counter presented herewith, illustrates an instrument that is believed to be an improvement in this line.

Its construction involves the principles of the stop-watch. Those who have tried to ascertain the number of revolutions of a shaft with the common counters, know the impossibility of observing the time and placing the counter in position at the same instant; and when the test is ended the operator is not generally satisfied with the results.

This counter can be placed in contact with a shaft, and allowed to revolve without moving the registering mechanism, and when the operator's watch indicates the proper time, the mechanism can be instantly connected without looking, from the stud shown at the side towards the handle. At the expiration of one or more minutes remove the counter, and the number of revolutions made will be found on the dial. In this way errors in time are eliminated, which, at high velocities, are important.

When the stud is moved from the handle the counter can be quickly set at zero by turning the longer hand directly, which is a matter of convenience. The instrument accurately registers 2,000 revolutions before repeating.

The triangular point is made separately, and connected to the spindle by a universal joint arrangement, which yields if the counter is not held exactly in line, insuring smooth running and accuracy at very high speed.

The point is of hardened steel; the other parts which are subject to the greatest wear are also steel. The case is nickel-plated, with ebony handle, which makes a neat finish.

The instrument was designed by W. G. Richards, and is now being introduced by "The Ulster Machine Company," E. D. Williams, president, P. O. Box 1422, Providence, R. I.

We clip the following from the *Locomotive:*

"About the most remarkable piece of engineering work that has come under our notice lately was a steam boiler *set in sandstone.* The blocks of stone were neatly dressed, and the work looked very fine outside, but the furnace and the pier supporting the back end of the boiler seemed to be in about the same condition that the eggs were in at a certain hotel where a guest ordered them poached, and the waiter strongly advised him to have them scrambled, 'for,' said he, 'them aigs ain't very fresh, boss, and dey *look* better scrambled!'"

Working for the Metric System.

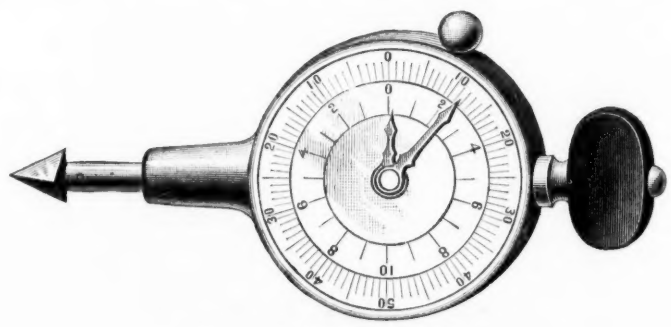
We have received the ninth report of the Committee of the Metric System of Weights and Measures, published by the Boston Society of Civil Engineers, which disclaims all responsibility for the publication. The most important feature of this report is, where mention is made of the fact that a bill is pending in the House of Representatives requiring the Government departments to use the metric system after March 4, 1889. Parties interested in agitating the advancement of the metric system are urged to get their friends to influence members of Congress to support the measure. If the next Congress will not take action in favor of the metric system, the policy to be pursued is to try the succeeding Congress. Keep trying appears to be the watchword.

In reporting progress of the metric system in this country, the Committee mention that electrical measurements universally recognized are, the ohm, volt, etc., all based on the metric system. At Minneapolis bags of flour have been put up in bags of 50 and 100 kilos for exportation to the Continent of Europe, and a firm in Boston is making a micrometer which is graduated either to the metric measure or to the decimals of an inch. Civil engineers are called upon to use the metric measurements where they can do so; and the case is mentioned of an engineer in Virginia who, in surveying some plantations, made his figures according to the metric system, and, much to his disgust and that of the Committee, had to reduce them to old denominations by his unappreciative employers.

All using water measurements are called upon to repudiate the United States gallon, for the reason that Great Britain abandoned that measure sixty years ago. If the metric system is not forced upon the people of the United States, it will not be for lack of zeal on the part of its advocates. Their discretion is not so apparent.

Assessment of Machinery in England.

The *London Ironmonger* says: "The manufacturers of Birmingham are taking alarm at a new method of assessing machinery, by which they become liable to pay considerably more rates than they have hitherto done. The new method of assessing strives to increase the rateable value of a manufactory by charging rates on machines attached to the freehold, which, of course, includes fixed engines and boilers. This vicious and unfair system will seriously affect manufacturers, not only in Birmingham, but in other parts of the country; the system has been tried at Leeds and Middlesboro' with varying success. If the new system is successfully introduced, manufacturers will be induced to use portable engines and semi-portable engines, where they now use engines fixed to masonry beds. It is difficult to know where an assessor will draw the line. To take the case of a drilling machine, it becomes simply a question of size whether it shall be rated or not, and the limit of size is left to the variable judgment of an assessor. Of course, where the drilling machine is of large size there will probably be no difference of opinion as to whether it is a fixture or not; but drilling machines are made in all sizes, from those which will bore a 60″ cylinder to a watchmaker's drill. At what size is the change to be made from rateable property to property not rateable? Or, to look at it from another point of view, why should one manufacturer be taxed on his machine, worth, say, £500, whilst another with two machines, worth £250 each, or even, say, ten worth £50 each, should be exempt? There is no logic in the system. Or, still further, why should a machine be rated, whilst the same amount of capital invested in lawyers' desks and office furniture, or in bankers' safes, escapes? It appears to us that in these competitive times the burdens upon manufacturers require to be reduced instead of increased. We are pleased to see the Birmingham manufacturers are not disposed to sit down silently under this new and unfair system of increasing the rates. Iron masters and heavy machinists will feel the new departure more keenly than those in the textile trades, for by some wonderful subtleties of the legal mind, looms are considered chattels, and therefore exempt from assessment. The spasmodic attempts which are being made in various parts of the country to stretch the meaning of rateable property will be disastrous to all manufacturers and owners of machinery, and must be strongly resisted even by appealing to Parliament to obtain the repeal, if necessary, of any old-fashioned law under which these attempts are being made."



THE STANDARD REVOLUTION COUNTER.

Coal is a serious item in the expense of ocean-going steamships in these days of fast ships and quick passages. Two thousand dollars per day spent for fuel is a sum exceeded by several of the swift transatlantic ships, and few, if any, of them, are making money. Some of the lines, it is said, will withdraw certain steamers "for repairs," and thus reduce expenses. It may be observed from the table below what the actual cost of fuel alone is for these largest vessels:

	Coal consumed per day. Tons.	Average knots per hour.	Cost of coal per voyage.
Oregon	337	$17\frac{9}{10}$	$18,872
City of Rome	304	16	17,024
Alaska	253	$16\frac{8}{10}$	15,168
Servia	214	$16\frac{5}{10}$	11,956
Aurania	214	$16\frac{7}{10}$	11,056
America	182	$17\frac{3}{10}$	10,192
Austral	115	$16\frac{3}{10}$	6,440

—Boston Shipping List.

Books that are Graveyards.

The seven directories to the iron and steel works of the United States, which have been published by the American Iron and Steel Association at stated intervals during the last twelve years, form a graveyard of buried hopes, shattered enterprises, and lost capital that may well arrest attention. It is usual for free-trade theorists and some light-witted editors to prate of monopolies that have been built up in this country and sustained by a protective tariff, but these silent books on our shelves bear testimony to the answering fact that fully one-half of the individuals, firms, and companies that were engaged in the manufacture of iron and steel twelve years ago are not now so engaged. Bad debts, low prices, competition, improvements in processes, insufficient capital, changes and threatened changes in tariff legislation, and doubtless in some cases lack of skill and enterprise, have brought about this result. Profits, therefore, could not, as a rule, have been large, or the men who were in the business twelve years ago would have stayed in it; they would not have sold out to others at a loss, nor have made assignments, nor have made the acquaintance of the sheriff. A protective tariff did not save them, and it surely did not make monopolists of them. The manufacture of iron and steel in this country has been proved over and over again to be a most precarious branch of business. Many, very many, have lost their all in it, and fruitlessly devoted to it their lives. We have briefly mentioned the causes of this fatality. Probably the most powerful of all these causes is tariff tinkering. It unsettles values, creates distrust of the future, and is an obstruction to trade. It seems, however, that we are always to have with us this source of apprehension and trouble.—From the *Bulletin of the American Iron and Steel Association.*

Patterns and the Pattern Maker.

BY CHAUNCEY WING.

In writing upon pattern making I shall aim to interest and instruct the reader who has not passed through the whole of the *mill* of pattern making. What I have to say will be more of experience than theory, more in the way of explaining facts as they have presented themselves, and as I have dealt with them.

Pattern making has a wider range from a standard or set course than most other mechanical trades, for the practice varies largely in different shops and localities, or, more concisely, in the various classes of work. To explain, I will say, for instance, the machinist, whether he is in Boston or New York, or other points East, West, North or South, if he is at work on steam engines, iron or wood working tools, or agricultural implements, has principally to deal with the metals iron and steel, and he therefore exercises his energy in becoming familiar with those metals, where to place them, and what tools to work them with.

With the pattern maker it is quite different. He is required on different classes of work to learn to place to advantage, and to shape a variety of woods, each the most suitable for some particular pattern; besides this he has the same school to go through with about the same number of different kinds of metals. This of course requires him to learn how to prepare and handle the different tools, to successfully cut and work into form the various elementary materials which he must use.

In certain shops all that is required is to know how to make wooden patterns, and it may be, that four-fifths of these are made of pine. He works at this place for a time without the thought of a piece of metal, and would be disgusted to find a stray chip on his bench, or in close proximity to his tools.

But the time comes when he hears that some other shop is in need of a pattern maker, and for some reason or other—perhaps the location or wages suits better—he decides to try a change, and goes to see the job. He finds the work here to be quite different; perhaps they are light, delicate patterns and must be made of hard wood, or that he must first make a wooden pattern, and then have a metal casting made from this, either of iron, brass or of some softer metal. Then he must file, scrape and polish the surface of this until it is smooth enough to work in the sand, and produce a casting of the required fineness.

A very large portion of small castings which are now made are too small to be moulded singly to advantage, and consequently must be duplicated, the exact number depending on the size of the piece, or the size of the flask in which they are to be moulded. These are finally arranged in gates, or simply connected to a main or central runner, in which the metal is to be poured to flow to each separate piece.

So we can see that the pattern maker is not confined to so beaten a course as most other mechanics. And it is a fact that there are scarcely any of the different specialties of mechanical handiwork, but he must become familiar with in order to bring to perfection

his own practice. To become an adept he must possess a fancy for and interest in his trade, must have energy and perseverance, for not like the machine hand, can he sit down with folded hands and watch the work march along to completion; none of this for the pattern maker.

I do not write thus to produce a sentiment in favor of the pattern maker as being a martyr, but he must confine himself to a continuous effort in order to make progress on work.

James Nasmyth.

The book entitled "James Nasmyth, an Autobiography," edited by Samuel Smiles, and published by Harper & Brothers, deserves to be read by machinists and engineers everywhere. The perusal of its pages cannot fail to interest and benefit them.

So long as the steam hammer continues to be used, forging the ponderous articles that have added greatly to the magnitude of certain engineering operations, the name of its inventor, James Nasmyth, is not likely to be forgotten. The men who invented many important mechanical appliances will live as long as the productions of their genius are used, but in too many cases the name becomes a mere abstraction. James Nasmyth by the autobiography which he has written ensures the preserving of a wonderful individuality in connection with his name. Even had his mechanical achievements been of less consequence to the world, his graphically related story, portraying the inner life of many men whose labors were the genesis of important mechanical industries, would have given him a lasting place in the annals of his country.

James Nasmyth was born in Edinburgh, Scotland, in 1808, and he is careful to establish the fact that his ancestors were men of high degree, who were leaders in war and carried armorial bearings which bore in Latin the motto "Not by art but by war." In the tumultuous times that succeeded the Reformation in Scotland, the Nasmyths were deprived of their landed property, and the branch of the family from which James sprang abandoned war to live by art. When James Nasmyth, by his mechanical genius, and persevering industry, amassed a fortune that entitled him to rank in affluence with any of his martial ancestors, he reversed the family motto making it read "Not by war but by art," and adopted the steam-hammer for a coat of arms.

The father of James was Alexander Nasmyth, a celebrated portrait-painter and artist who interested himself in numerous scientific investigations. To aid him in mechanical studies, he had a workshop fitted up in his house with a small forge, a lathe and other convenient tools. Like many others who have raised themselves to eminence, James Nasmyth was an indifferent scholar, and entertained honest animosity to Latin, Greek and all kinds of grammar, but in his father's workshop he found attractions that never wearied. He was a natural mechanic. A great part of his play took the form of making toys for himself and companions—turning wooden tops on his father's lathe, forging tinder steels out of old files, improving the huge door key of the period into miniature cannon for noise-making purposes, and even going the length of casting a small brass cannon and boring it out ready for use on a high gala day. His special recreation took the form of visiting iron foundries and machine shops around Edinburgh, and the most attractive amusement he found in such places was learning to temper steel and to perform difficult feats of lathe work. This was not a hobby to be followed a few months and then dropped; it was a passion that began in early boyhood and lasted through his manhood. He continued to believe that he obtained lasting benefit from the practice of making toys and implements needed for experimental purposes. On this theme he says:

"I often observe in shop windows every detail of model ships and model steam engines supplied ready-made for those who are said to be of an ingenious and mechanical turn. Thus the vital forces of resourcefulness are done away with, and a sham exhibition of mechanical genius is paraded before you by the young impostors—the result for the most part, of too free a supply of pocket money. I have known too many instances of parents being led by such false evidence of constructive skill, to apprentice their sons to some engineering firm; and after paying vast sums, finding that the pretender comes out of the engineering shops with no other practical accomplishment than that of glove wearing and cigar smoking.

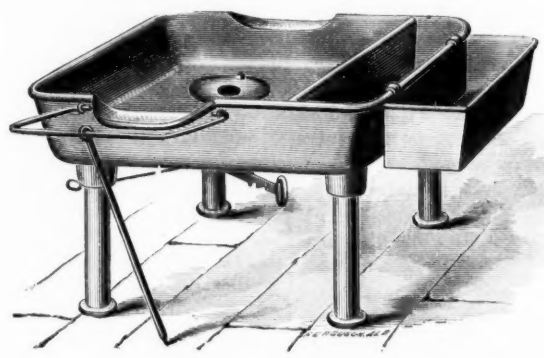
"The truth is, that the eyes and the fingers—*the bare fingers*—are the two principal inlets to sound practical instruction. They are the chief sources of trustworthy knowledge in all the materials and operations which the engineer has to deal with. The nature and properties of the materials must come in through the finger-ends; hence I have no faith in young engineers who are addicted to wearing gloves. Gloves, especially kid gloves, are perfect non-conductors of technical knowledge."

Although James made but little progress in classical studies he did well in mathematics and in natural science. He also displayed apt artistic tastes, and under his father's able tuition soon became accomplished in various lines of drawing and sketching. Of his studies and practice of drawing, he says:

"My father was an enthusiast in praise of this *graphic language*, and I have followed his example; in fact it formed a principal part of my own education. It gave me the power of recording observations with a few graphic strokes of the pencil, and far surpassed in expression any number of mere words. This graphic eloquence is one of the highest gifts in conveying clear and correct ideas as to the forms of objects whether they be those of a simple and familiar kind, or of some form of mechanical construction, or of the details of a fine building, or the characteristic features of a wide-stretching landscape. This accomplishment of accurate drawing, which I achieved for the most part in my father's work-room, served me many a good turn in future years with reference to the engineering work, which became the business of my life."

From the making of toys and small curiosities James worked into quite a business of making models of steam engines for the use of colleges and technical schools, for which he got fairly well paid. This brought him some mechanical reputation around Edinburgh, and obtained for him an order to make a road steam carriage for the Scottish Society of Arts, a job which he executed satisfactorily. This was in 1827, when he was nineteen years old. All the work on the engine was done by himself, forging, moulding, turning and fitting, and he pursued the work so zealously that he became an expert mechanic. The skill he thus acquired he hoped to use for the purpose of obtaining entrance into the machine shops owned by Henry Maudsley of London, where he was ambitious to learn mechanical engineering.

Maudsley was at that time the most celebrated engine builder and machine tool maker in Great Britain, and was quite a famous mechanic, although he is known in this country principally as the inventor of the lathe slide rest, and of the leather collar for the hydraulic ram. Alexander Nasmyth had got acquainted with Maudsley through some of his scientific friends, so when James was about twenty years old and had finished a course of study in the Edinburgh University, his father accompanied him to London. On visiting Maudsley they were disappointed by being told that he had ceased taking premium apprentices, because he found they were a nuisance about a shop, but he treated father and son very courteously and accompanied them round the works. While they were making the rounds of the engine house a fireman was wheeling ashes away from the boilers, and James remarked to Maudsley: "If you would only permit me to do such a job as that in your service, I would consider myself most fortunate." Maudsley glanced keenly at the youth and said: "You are one of that sort, are you?" This incident probably made a good impression, for Maudsley agreed to examine some drawings and a small engine made by James, which they had brought from Scotland. On seeing this work he agreed to take the young man as an assistant. Here James remained for two years and a half gaining valuable experience in machine work, his facility at artistic drawing proving useful to himself and employers. Being required in the course of his work to make the model of a pair of marine engines, he invented a milling attachment for a lathe to do the work uniformly. Maudsley took great interest in making screws of uniform size, an innovation on the machine shop practice of the time which was to fit each nut to its own bolt. Maudsley designed taps and dies of certain sizes, and labored to establish standards, a work that was subsequently perfected by Whitworth. Nasmyth credits Maudsley with being the originator of the system that makes screws of established sizes, but we think Eli Whitney, of America, labored on this line of mechanical improvement before it was touched by any British mechanic. The leading scientific men of London seem to have interested themselves mainly in the mechanical operations carried on in Maudsley's works for Prof. Faraday, Lord Brougham and other eminent men who were frequent visitors. The making of machine tools was then in its infancy, and Nasmyth gives interesting details regarding the progress of improvements pushed by Maudsley. "Simplicity" was the maxim of that engineer in his designing of all kinds of machinery. He had a happy knack in his contrivances and invention of making short cuts to the object in view. He avoided complexities, did away with roundabout processes however ingenious, and went direct to the point. The advantage of this policy he impressed upon all those who received inspiration from his example.



STATIONARY BLAST FORGE.

While still a youth, James Nasmyth formed a mental plan of his life's work, and he carried it out with persistent perseverance. He believed that he could start a machine shop on a small scale, and work up to a prominent position as a manufacturer, his own skill and industry making up for want of capital. In pursuance of this plan, he quitted London a few months after the death of Henry Maudsley in 1831, having in the meantime made a slide-rest lathe and small planer for use in his future operations. He opened a small shop in Edinburgh, his whole help consisting at first of a stout fellow, who turned the wheel which gave motion to his big lathe. As work began to come in, he took on a millwright named Archibald Torry, who became a valuable assistant, and remained with him for twenty years. His locating in Edinburgh was a temporary arrangement, for the purpose of giving him time to prepare the principal tools that he would need in a larger machine shop. When his tools were ready, he determined to remove to an English manufacturing center. His method of making a choice of location was characteristic. He says:

"It was a question which would be the best place to settle in—Liverpool or Manchester. I had seen striking evidences of the natural aptitude of Lancashire workmen for every sort of mechanical employment, and had observed their unsparing energy while at work. I compared them with the workmen I had seen at London, and found them superior. They were men of greater character; they struck harder on the anvil; their minds were more capacious; their ingenuity was more inventive. I felt assured that in either Liverpool or Manchester—the centers of commercial and manipulative energy—I could settle down with my limited capital and tools, and in course of time contrive to get on, helped by energy, self-reliance and determination. I also found that the demand for machine-making tools was considerable, and that their production would soon become an important department of business."

Manchester suited him best, and there he settled. The kindness he received from the strangers in that city is gratifying to read about. In this connection, he testifies to the numerous acts of hospitality and generosity performed towards him. He was introduced to the brothers Grant, the brothers Cheeryble, of Dickens, and received many kindnesses from them. The oldest brother asked, in a kindly way, how much capital he had to start business on, and, on learning that it amounted to £63, the old gentleman whispered that James would find a credit of £500 at his office *and no security*.

Commencing business as he did just as the railway system of Britain was opening out, he got the benefit of a strong flood tide of mechanical progression, which James Nasmyth had shrewdness enough to use to his own advantage. Within twenty-five years he amassed a fortune from the proceeds of his industry. All through his business career he took a prominent part in engineering achievements, and he is fond of dilating on his own inventions, but it is doubtful if the world will give him credit for much originality in this respect. There is a saying that the self-made man nearly always worships his creator. James Nasmyth was a self-made engineer, and his autobiography takes care to let the world know the full extent of his greatness; but it is an admirable book, recording the events of a worthy life, and it ought to be read by every young man in the country.

No. 6 Stationary Blast Forge.

The old time brick forge, cumbersome, unhandy and expensive, has, with slight variations, clung to the art of blacksmithing for the past 100 years. Of late, however, iron forges, possessing many advantages and at small cost have come into use, and will probably eventually entirely displace the brick forge.

The engraving represents an iron forge, made by the Empire Portable Forge Company, Cohoes, N. Y. This forge is designed more especially to meet the requirements of railroad and other large, well-appointed forge shops. It is constructed of heavy cast iron plates, and supported by pipe legs. It is finished with water and coal boxes, and tool rest, and provided with adjustable "Empire" tuyeres, by which the quantity and force of blast can be exactly regulated from full force and quantity to entire cut-off. Blast can be had from a power blower, hand blower or bellows.

Although the capacity of this forge is for heavy work, it occupies but little room, affording space underneath for tools and work; it can be readily and quickly removed if desired.

The height is 26″; the fire pan is 28″×51″, it weighs 400 pounds.

A heavy wheat train pulled into Fargo by one engine, a few days ago, on the Northern Pacific Railroad, consisted of 110 cars loaded with wheat. This would make, allowing 550 bushels to the car, a weight of 3,630 000 pounds, while the cars weigh 2,729,000 pounds, making 6,359,000 pounds pulled by one locomotive, or about 3,180 tons. The train was over three-quarters of a mile in length.

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NEW YORK, DECEMBER 20, 1884.

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The Business Situation.

Business is not brisk in the mills, shops and factories of any section of the country; but the daily newspapers are apparently making an effort to exaggerate the depression (if not to make it worse) by publishing a series of telegraphic items about reduced wages, short hours, discharging hands, and temporary shutting down of individual establishments. There are no natural causes for the depressed state of business—all the causes are artificial, and can be removed. Legislation has much to do with it, and the people expect some remedies from the Congress now in session. As long as prices are declining, investments in new enterprises or extensions of old enterprises must remain restricted, but as soon as it becomes evident that prices are at or very near the bottom a quick reaction will follow. Advances are much more rapid than reductions, and those who are in position to take advantage of the upward movement when it begins will gain a substantial benefit. There is a more hopeful feeling in manufacturing circles than existed two or three weeks ago.

As long as an immense surplus remains in the United States Treasury there will be unpleasant notes of surplus production. When the Treasury surplus goes into circulation the products of industry will be distributed for use.

Our National Defences.

To judge from the attention paid throughout the country to the recommendations made in the President's Message respecting the necessity for better means of defence against possible foreign aggression, it looks as if Congress were likely to make the required appropriations for the construction of ships and for improving our gun-making facilities. Despite the jeremiad that went forth over the breakage of the Dolphin's crank-shaft, this country is in a very fair condition for the building of good iron-clads or any form of torpedo boat that may be deemed most efficient for naval purposes. Although this country has done little in the way of man-of-war construction since the revolution from wooden-walls to steel plates, the mechanical skill to perform just such operations as are required in building large steel ships has been fostered and developed among men employed in general machine business, thanks to the protective policy that rendered such work remunerative. The ships hitherto built in our ship yards are small, but they will favorably compare in quality with any vessels afloat; and there is no great difficulty in expanding sizes when the call for vessels of huge proportions arises.

Should trouble arise between this country and any foreign power that led to the calamity of war, more urgent than the building of a fleet would be our necessity for means of coast defence. To protect our harbors from the huge long-range guns of European make, we need the means of making ordnance equally powerful, and that we do not now possess. There is no lack of the necessary mechanical skill, but the means of making the quality of steel castings required have not been provided. The Congressional committee appointed to enquire into our ordnance-making facilities, have reported in favor of appropriations being made to provide plants that will turn out guns equal to the best made elsewhere. It is to be hoped the recommendations will prove convincing, and that the country's needs will not be neglected through factional belligerency.

Under the existing condition of our coast defences, there are foreign vessels that could steam within range of some of our leading cities, and hammer the buildings to ruins with their long-reaching cannon, while our own guns would make no impression even if their puny shot ever reached the steel clad covering of the enemy. Recently a gun was completed in Manchester, England, which weighs 110 tons, and has a steel tube that weighs 26 tons alone. The length of that tube is 42½ feet, and the outside diameter is 27 inches. The tube was made of fluid steel under great pressure, forged hollow, with a bore 14¾ inches diameter. These are the kind of guns that would send their messengers of destruction into our cities should any important foreign power attack us, and guns of that kind we ought to be able to make, if peace is to be preserved, by showing that the nation has might to defend the right.

Abolishing a Public Convenience.

Wholly apart from politics, and without advocacy of or reference to any system of finance whatever, we desire to raise an emphatic protest against any legislation intended to carry out a recent recommendation contained in the annual report of the United States Secretary of the Treasury, and endorsed by the President in his annual message. We refer to the proposition to discontinue the issue of $1 and $2 bills, without providing any other substitute than the silver dollar. It is safe to say, that a large part of the American people find it convenient at some time, if not frequently, during each year, to transmit small bills of these denominations through the mails and otherwise, and the abridgement or abolition of this convenience is wholly without necessity or excuse.

Large numbers of our people do not find it convenient to use bank checks for such small payments, and obtaining money orders, express orders, postal notes or postage stamps, is often inconvenient, especially to workingmen, whose daily duties abridge the leisure time at their disposal during the hours when such facilities can be had. There are other reasons which could be cited to illustrate the greater convenience of small bills in the daily business transactions of persons of small means, as compared with the bulky coins that the Secretary proposes to substitute, but the reason already referred to should be enough to defeat this vexatious and unnecessary proposition. We hope a general protest will be made against it.

So far from abolishing $1 and $2 bills, the convenience of the people would be served by the issue, in addition, of fractional currency, say 25 and 50-cent notes, not for the purpose of superseding the smaller silver coins, but for supplementary use in transactions involving the transmission of small sums through the mails and otherwise.

A British Mentor.

Some of us were interested in the arrival of the steamer Umbria, through the expectation that she was likely to prove the fastest vessel afloat, but we were not aware how important an event her first voyage was till we learned by the *Herald* that she brought over William Bryce Douglass, constructing engineer for John Elder & Co., Glasgow. William Bryce Douglass is a walking cyclopedia of marine and mechanical knowledge, and his interviews with reporters convey to the American world that anything relating to marine or mechanical knowledge not understood thoroughly by William Bryce Douglass is not worth knowing. While conscious of his power, William Bryce Douglass ought to have been a little merciful on American ignorance, for his expressed compassionate contempt for our little ships and little engines is a little exasperating to a people doing their little best. The authoritative way in which William Bryce Douglass decided how navies ought to be built impressed us with the belief that we were reading the words of one of the ideal John Bulls, who is certain that no opinion is worth a farthing compared with his own, and nothing out of the southern portion of the British Isles is worth looking at; but his name is a mixture of Scotch and Irish, and it is an anomaly for a man bearing his multiplex appellation to inherit the calm egotism conspicuous in his opinions. Did not William Bryce Douglass bear such a close resemblance to the Southron, who knows of nothing and believes in nothing outside of England, we would mention a few creditable engineering feats that have been performed by Americans, and we might have given reasons for our belief that American engineers will be found competent to the building of ships or engines equal in magnitude to anything made by other engineers when the demand comes round, as it will some day. As we are certain that our labor would be lost, we close by expressing the regret that Mr. Gladstone is neglecting British interests by omitting to make William Bryce Douglass first lord of the British Admiralty.

An Unjust Tax.

There is a growing antagonism among the steam engineers of New York City against the tax of $2, which is charged for certificates of competency, going to the funds of the police department. Joel W. Hopper recently tested the legality of the act allowing the imposition by refusing to pay the fee. The police commissioners retaliated by refusing to grant a certificate. He then applied to Judge Bartlett, in Supreme Court Chamber, for a mandamus to compel the commissioners to give him a certificate. His counsel, Christian Moritz, argued that the legislative act was unconstitutional, because private or local in character, and embracing subjects not expressed in its title, and because it authorized taxation for a private purpose, and was an unjust preference of one class of citizens over all others. Assistant Corporation Counsel Masten argued that the fee was proper as a license fee, and that when it went into the Police Pension Fund it was applied to a public use. Judge Bartlett has denied the motion for a mandamus. The only course now open for the steam engineers is to use efforts with the members of the legislature to have the obnoxious tax repealed.

Correction.

In our issue of December 6, where an account was given of the interesting photographic views of the interior of anthracite coal mines, displayed by Mr. E. F. C. Davis at the meeting of the Mechanical Engineers' Society, a typographical error occurred in the name of the photographer. It should have read George M. Bretz, of Pottsville, Pa.

Through the courtesy of Postmaster-General Hatton, we have received a great many Government official publications relating to industrial matters. Mr. Hatton is an old-time editor, and appreciates the needs of journalists. When he ran the Burlington *Hawkeye*, its pages were always ready to advocate new business enterprises, and more than one establishment that adds wealth to Burlington was located there through Mr. Hatton's good offices.

The International Inventors' Exhibition, to be held in London in 1885, will open in May, and continue for about six months. The limit of time in which to receive applications for space has been extended to January 31, 1885. No charge is made for space. A number of gold, silver and bronze medals are to be awarded. All necessary information and printed forms of application will be furnished by J. Pierrepont Edwards, British Consul, New York. It would doubtless benefit a great many American manufacturers to show their productions at this Exhibition.

Italy is a country of anomalies. While the people are in a general way as enterprising as other progressive nations, in some respects they are curiously conservative. They build excellent ships, and the locomotives made in Italian workshops are good; yet there is not a steam fire engine in the land. With their household gods the common people inveterately resist innovation. There is remarkably little difference in the appearance of household articles found in ordinary dwellings to-day and those found in the resurrected houses of Pompeii, the corkscrew being the only article that had no counterpart in a Pompeii house.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(484) **G. L. T., Pitts, Pa., asks:** Can you tell me of a paint that will stand heat—something for smokestacks? *A.*—Asphaltum dissolved in turpentine, over a gentle fire, is perhaps as good as any.

(485) **C. L., Lancaster, Pa., asks:** What are the standard sizes for boiler plate of different thicknesses? *A.*—Boiler plate is furnished by the mills in any ordinary sizes required. There is no standard of sizes for different thicknesses.

(486) **H. F., New York, asks:** Will you inform me whether the case of the Canal Street engineer, who protested against contributing to the relief fund by way of license fees, has been decided? *A.*—We believe that the case was decided against the engineer.

(487) **C. L., New York, writes:** I have a 400 horse-power battery of boilers. Will the exhaust steam from a 50 H.-P. engine heat the feed-water for these boilers to 200° in an ordinary coil heater? *A.*—No. You may be able to increase the heat of the feed-water by 60° or 80°.

(488) **A. L. M., Wilmington, Del., says:** 1. Can a locomotive be operated with one connecting-rod off? *A.*—It can. 2. If it can be operated with one rod, does it possess power to move ahead when the crank pin is on the lower quarter? *A.*—The engine exerts its greatest tractive power when the crank pin is on the quarter, and it will certainly move in that position.

(489) **A. G. U., Chester, Pa., asks:** 1. Will a one-ring piston work satisfactorily in a 2½″x 8″ piston? *A.*—Some kinds of single-ring packing will work satisfactorily. If you mean simple s ring rings we should use two. 2. What should be the size of steam and exhaust ports for a speed of 300 revolutions per minute? *A.*—You can get good results from steam ports ¼″x2″; exhaust port ½″x2.″

(490) **J. M., Chicago, Ill., asks:** Should a patentee in this country take out foreign patents in order to protect him in manufacture, and what will such patents cost? *A.*—You do not need foreign patents to protect you in this country, but, of course, if you wish protection in foreign countries you must secure patents there. The cost differs in different countries. Thorough protection abroad will cost about $2,000.

(491) **H. ———, writes:** I am constructing an hydraulic lift to raise 5,000 pounds. The size of ram is 6″ diameter. The pump plunger is 15-16″ diameter. Can a man operate the pump easily with a crank wheel? *A.*—The total pressure against which the plunger will work will only be about 125 pounds, and as the handle of the crank wheel may move several times as fast as the plunger, we should say there would be no trouble in operating.

(492) **J. L. H., Bowling Green, Ky.,** writes: We have just completed a small copper boiler of the locomotive type. The barrel is 4″ diameter, 20″ long, with 34 tubes 3-16″ inside diameter. The fire-box is 3½″x5″x5½″. We find that the smoke and heat will not pass through the tubes, neither will shavings or the dryest of fuel burn in the fire-box. 1. What do you think is the trouble? *A.*—The trouble is that the tubes are too small. We do not believe you will have success with tubes less than ½ ′ diameter; certainly not less than ⅜″. 2. The barrel and outside sheets are 1-16″ thick; fire-box ⅛″ thick; rivets spaced ½″; circular crown sheet; staybolts spaced ¾″, all work being well done. What pressure will it stand? *A.*—If, as you say, it is well constructed, it should be safe at any pressure less than 150 lbs. Before using, however, we should test it with water pressure at 50 per cent. higher pressure than it is proposed to use.

(493) **F. U. V., Matteawan, N. Y., writes:** We use a large number of rolls 14″ long and 8″ diameter, cast hollow, with 3″ metal at ends. We bore out the ends for a 2″ shaft, and force the shaft into the roll. Is there any way by which these shafts can be cast in the rolls and be solid? *A.*—We have referred this question to L. C. Jewett, who suggests the following: "Countersink holes in the shaft where the cast iron comes, using, say, a ¾″ drill, ground so as to make the holes shallow in depth, then tin them. Pour with gates on each end of roll and either side [both sides] of shaft, with flow gate on top. If metal is poured hot, I think they will be solid. I have been successful with such work by painting with red lead mixed with naphtha. I presume, if the roll was poured at one end, using the two other gates as "run offs," it would do. If one end is welded the other end will not vibrate much. The core must, in any case, be perfectly dry, with good outlet for vent. It should not be set in the mould until the last minute before pouring."

(494) **T. T., Springfield, Ohio, writes:** I am running an engine 12″x24″, cut-off at half-stroke, revolutions, 100 per minute. The boiler is 50″ diameter and 14 feet long, and has 30 flues 5″ diameter. The upper row of flues is 13″ from the shell at center The engine is crowded, and the boiler uses, in my opinion, too much water and fuel. The feed water is heated to 200 deg. I think there is not steam room enough, and propose to remove the top row of flues, 6 in number. The boiler foams badly. I have seen mud as thick as apple butter pour out of the safety valve. What will be the result of removing the upper row of tubes, using stay rods in their place to hold the heads? *A.*—There are too many flues in the boiler; we think it advisable to remove the upper row. Cannot you keep the boiler cleaner than your letter would indicate by occasional blowing down? So much mud in the boiler will cause foaming, and is dangerous. It is also destructive to the engine.

(495) **W. S., Knappton, W. T., writes:** We have had trouble with a boiler we put in a boat. The boiler is 48″ diameter, 11 feet long, and has 67 tubes 2½″ diameter, placed in vertical rows. The grate is 24″ from shell. There is a bridge wall 12″ from shell, and about five feet from front of furnace. The boiler is made of ⅜″ material, branded 50,000 T. S. It is double-riveted, and rests at the back end on the mud drum, and in front on the casting. The feed-water is taken from the hot well and into the boiler through a perforated pipe about seven feet long, and just above the tubes, closed at the inner end. In the first two days the boiler bulged out above the bridge wall ½″, the bulge extending about one-half the circumference of the boiler and 8″ long. I would like to ask: 1. What do you think the cause of the sheet bulging, and is it dangerous? *A.*—It seems evident that the boiler has been overheated at the point named, but why it was overheated (since it could not get foul in two days), we cannot tell, nor give an opinion without a sketch of the arrangement of tubes. If the tubes are close to the shell it is possible that the intense heat at bridge wall keeps the water away from the sheets. The bulging is dangerous, and you should have the boiler examined at once by the inspector, or some competent engineer. 2. Is this a good way to feed the boiler, or would it be better to feed in the mud drum? *A.*—It is quite a common way of feeding boilers. We have heard no other complaint of it except that the holes in the pipe are likely, after some time, to fill up with lime. We should not recommend feeding through the mud drum.

BUSINESS SPECIALS

Transient Advertisements, 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Curtis pressure regulator and st'm trap. Dec. 13, p.10.

Katzenstein metallic packing, 169 Christopher st., N Y

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Figs. per set $1.00. S. M. York, Cleveland, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Power Measured—F. Van Winkle, mechanical engineer, 22 Cortlandt street, New York.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Mech'l drawing and machine designing, work requiring skill and experience solicited Reasonable rates. Corresp'nce invited. Weston & Smith, Syracuse, N.Y.

DRAWINGS — Mechanical, electrical and Patent Office. All styles of artistic designing. Special facilities. Low rates. Wallace Metcalf, 140 Nassau St., N.Y.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham St., N. Y.

Farley's Reference Directory of the Machinists, Iron, Steel, and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Locomotive Engine Running. By Angus Sinclair. Price, $2. A handsome, interesting book. Just the thing for a holiday gift. Published by John Wiley & Sons, 15 Astor Place, N. Y.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

Useful Information for Steam Users—A 100-page pamphlet, on the care and management of the steam engine and boiler, with hints and rul s for engineers and firemen. Every engineer should have this book. Send 25c. in P. O. stamps to the J. N. Mills Publishing Company, 145 Broadway, N. Y.

MANUFACTURES.

E. Morton, of Chicago, will start a large furniture factory at Yazoo, Miss.

Cassiday & Galley contemplate erecting a wagon factory in Raleigh, N. C.

A machine-room and round-house are being built at Vicksburg, Miss., by the Valley Railroad.

The Merrimack Woolen Mills, Dracut, Mass., are running extra time, being crowded with orders.

Hiram W. Hollis, 471 West 57th St., New York, will erect a factory 50x200 feet, four stories high.

S. T. Giles, Chattanooga, Tenn., has been negotiating for a site for agricultural machinery works.

The Russell & Erwin Manufacturing Company, New Britain, Conn., are running their factories nine hours a day.

Mr. Martin Wild, Jr., a large shoe manufacturer of Brockton, Mass., is about to build a new factory 190x70 feet.

Hannen & Son, 334 Greenwich St., New York will erect a factory on White St., 94x80 feet, seven stories high.

There are now in course of erection in the Southern States 23 cotton mills, which will cost $3,250,000 when finished.

J. E. Murray, of Ohio, has decided to erect extensive carriage and wagon works at Chattanooga, Tenn., in the spring.

N. W. Beeson & Co., Abbott's Creek, N. C., contemplate selling their mills and shops and removing to Lexington, N. C.

A company with $50,000 capital stock has been organized at Mount Sterling, Ky., to manufacture iron fences, machinery, etc.

The proprietors of the Detroit, Mich., Steel and Spring Works contemplate the erection of another building to enlarge their capacity.

It is proposed to locate a new rolling mill in New London, Conn., as that city offers inducements in cheap transportation of iron and coal.

A new hat factory is being built in New Milford, Conn., and the local merchants have donated in order to give the enterprise a good start.

H. F. Debardeleben, of Birmingham, Ala., has contracted for a 15-mile railroad to be constructed from Birmingham to his Cahaba coal mines.

Swift & Hamburger, Waynmanville, Ga., are putting a large amount of machinery into their cotton mill with a view to increasing its capacity.

The Danville, Pa., Nail Manufacturing Company propose to build an addition to their works in order to meet the requirements of their increasing trade.

It has been decided by the Excelsior Watch Company, of Williamstown, Mass., to go on with the new enterprise, and active work, it is hoped, will be begun soon.

The New Haven clock shop employes have resumed working on ten hours' time. For the past three months the men have worked only eight hours per day.

The Buford Plow Company, of Rock Island, Ill., which became financially embarrassed last summer, now resumes business with an increased capital and 500 hands employed.

The Winchester Arms Company, New Haven, Conn., are soon to build an addition to their own gun factory. The new building is to be 150 feet in length and four stories in height.

Armstrong Bros., Springfield, O., intend to enlarge their works by building new boiler shops. They have put up 12 boilers at the New Orleans Exposition, each 28 feet by 42 inches.

About 100 hands are employed in building the shops of the New Orleans and Northeastern Railroad, at Meridian, Miss. The main building is 317 feet long. These works will be completed this winter.

Fay & Scott, Dexter, Me., have shipped to Cuba a 16″ pattern-makers' lathe, on a 16′ bed, made in two sections of 8 feet each and bolted together, and also a milling machine and a set of milling machine centers.

Raymond, N. H., is to have a new shoe factory, the citizens having raised $1,000 to purchase an engine and machinery, and fit up a shop for C. N. Hoyt, of Haverhill, Mass., who will move his business there.

A new shop, 100 feet square and nicely furnished with new machinery, has recently been fitted up by the Pawtucket Machine Company, of Pawtucket, R. I., who are now putting on the market a variety of new tools.

E. G. Stevens and F. L. Fenton, of Boston, have purchased fire brick works recently finished at Birmingham, Ala., and will put them in operation. Expect also to erect iron pipe works.—*Baltimore Manufacturers' Record.*

Hewes & Phillips' Iron Works, Newark, N. J., builders of machine tools and steam engines, are running their whole force full time, and part of them extra time. The demand for their improved machinery is good.

The town of Easton, N.H., voted at a town meeting Saturday, Nov. 15, without much opposition, to exempt from taxation the starch factory property of Johnson & Phair, for five years, provided they rebuild at Sprague's Mills.

The water famine at Altoona, Pa., has caused the closing of part of the Pennsylvania Railroad shops on account of a lack of the necessary water. A large force of workmen were in consequence temporarily thrown out of employment.

Stillwell & Bierce Manufacturing Company, Dayton, O., have just completed a two-story brick addition to their works, 175x40 feet, for their wood-working department. They manufacture turbine water-wheels and feed-water heaters.

Prominent shoe manufacturers of Lynn have decided to establish their business at Laconia, N. H., this fall, occupying the old Belknap mills, and employing 300 hands. Citizens have volunteered $500 for necessary expenses in repairs, and the town has offered extra inducements.

The American Watch Company, at Waltham, Mass., will cut down the wages of its employes from ten to twenty per cent., and reduce the work-day to nine hours. It is intended gradually to reduce the watch manufacture from about 1,600 per day, the present quantity, to 1,000.

Judge Colt, of the United States Circuit Court of Massachusetts, recently granted the Siebert Cylinder Oil Cup Company of Boston, a permanent injunction in their suit against Peter Barclay, for manufacturing and selling lubricators embodying the sight-feed patents owned and controlled by that company.

The Acme Machinery Company, Cleveland, Ohio, have issued a very neat illustrated catalogue and price-list of the bolt and nut machinery manufactured by them. The catalogue is one of 52 pages, and seems to be complete in all details. Considerable special information is given about making and repairing bolt cutter dies.

A wire mill is to be started at New Brighton, Pa., on the co-operative plan. The capital is to be $20,000, of which $13,000 is subscribed. The capacity is to be about 20 tons per day, and an order was offered, if the works were established, of 10 tons finished work per day, the parties giving the order to furnish the material. About 50 men will be employed at the start.

The fine, new McQueen Locomotive Works, which were built at Schenectady, N. Y., last year, and have been standing idle ever since they were put up, are likely to be utilized soon. Owing to the depressed state of railroad business and, consequently, the difficulty of obtaining orders to build new locomotives, the shareholders refused to supply the funds needed to put the works in condition for building engines. Ex-Senator Charles Stanford has now come forward and bought up $150,000 worth of the stock, and the report is made that he intends putting the shops to work within a few months.

In our issue of July 14, 1883, we illustrated the complete plant of automatic machinery invented and built by Norton Bros., of Chicago, for the manufacture of fruit and other cans, hitherto made mainly by hand, or upon isolated machines. We now learn from the *California Grocer and Canner*, of San Francisco, that the Norton plant at work in the Pacific Can Company's factory, that city, is now turning out cans at the rate of 80 a minute, or about 50,000 a day. Even this number is not the full limit of the capacity of the plant, the cutting-out and squaring machines having about double that capacity. Over four million cans have been manufactured by this company on these machines during this season, without a single complaint of bad work. We understand that similar plants are now being built for New York and Baltimore, both important canning centers.

The Westinghouse Machine Company, Pittsburgh, Pa., shut down partially during the month of November, to put in new tools, enlarge their foundry, and build a new erecting shop and storeroom. They have started up with a capacity of 100 engines a month. In spite of dull times their business has increased, and is still growing. The business for October was the largest in their experience, the sales amounting to 75 engines. Contracts recently made insure the sale of the entire product of the works when running full with increased capacity. They are willing to let the public know to whom their engines are sold, not having any fear that others will get their customers away. Among a number of minor sales to private parties for electric lighting, the Westinghouse Machine Company report the following recent sales of their automatic engines to corporations: The Lincoln Electric Light Company, of Lincoln, Neb., two engines of 60 horse-power each; the United States Illuminating Company, of Charleston, S. C., five engines of 60 horse-power each; the Toledo Electric Light Company, Toledo, Ohio, one 60 horse-power engine; the Hastings Electric Light Company, of Hastings, Neb., two 35 horse-power engines; the Thomson-Houston Company, of Quincy, Ill., three 60 horse-power engines; the Central Electric Light Company, of Chicago, three engines of 45 horse-power each. The Thomson-Houston Company, of Philadelphia, are also putting a 60 horse-power Westinghouse automatic engine into their shops and test room. Sales have been made to paper manufacturers within the past thirty days, as follows: Susquehanna Water Power & Paper Company, Conowingo, Md., 35 horse-power; Lowell M. Palmer, Brooklyn, 35 horse-power; Timothy Vinton, Brattleboro, Vt., 25 horse-power; R. Beardsley, Ann Arbor, Michigan, 35 horse-power; Newton Paper Company, Holyoke, Mass., two engines of 60 horse-power each.

The plane manufacturers of the United States, at a recent two days' union in Greenfield, Mass., every manufactory being represented, reported a very prosperous year's business. Prices were advanced.

The organization of the national association of carriage hardware manufacturers was lately completed at Meriden, Conn., these concerns being represented: The Clapp Manufacturing Company, of Auburn, N. Y.; Upson Nut Company, of Unionville, N. Y.; J. Wilcox & Sons, of Portchester, N. Y.; the Syracuse (N. Y.) Iron and Steel Company; H. M. Streby & Co., of Newark, N. J.; the Sperry Manufacturing Company, of Ansonia; Wilcox & Howe, of Birmingham; M. Seward & Sons, and C. Cowles & Co., of New Haven; J. B. Savage, of Southington; H. D. Smith & Co., Plantsville; the Beecher Manufacturing Company, of Meriden. This represents $4,000,000 of capital and includes every carriage hardware manufactory of note in the country but two, who wrote that they would stand by the action of the association. It was decided to form pooling combination, no member of which will be allowed, under penalty, to manufacture beyond a certain amount of goods. The combination will, at a future meeting, arrange a scale of prices to be binding on all. The president of the association is E. D. Clapp, of Auburn, N. Y.; secretary and treasurer, F. L. Cowes, of New Haven.

Machinists' Supplies and Iron.

NEW YORK, December 4, 1884.

When our last week's report was made out there was a very depressed feeling among the dealers visited, but that has now to a great extent passed away, and hopeful expressions are heard as to the business of the near future. It is a little hard to find on what the improved feeling is founded, but it is there, although the present volume of business shows no increase.

Iron—The condition of the market for pig is slightly better than it was last week. Prices are not quoted higher, but it is not so easy to obtain concessions below quotations. The sales are light, buyers confining themselves to immediate wants in expectation of lower prices. The course of natural restriction going on prevents stocks from accumulating, and buyers will probably be disappointed in their hopes for still lower quotations. No. 1 X Foundry is quoted, for best brands, $18.50 to $19.50; No. 2 X, $18 to $18.50; Grey Forge, $15 to $16.

Scotch Pig—The demand for this iron continues light, and the market dull, with prices tending downward. We quote Shotts, $21.50 to $21.75, to arrive; Coltness, $22, to arrive, and $22.50 from yard; Carnbroe, $20.50; Eglington, $19.50; Langloan, $21; Dalmellington, $19 50.

Antimony—The demand for Regulus has been moderate, and the market steady. Hallett's brand is quoted 10¼ to 10⅝ cents; Cookson's 10⅝ cents

Copper—The market has ruled dull and prices depressed. Lake is sold at 11 to 11⅛ cents.

Lead has been slightly firmer. Common pig is quoted at 3½ cents.

Tin—There is no special condition of this market. It continues quiet, with sales light and prices easy. We quote for jobbing lots Banca 19 cents; Straits and Malacca, 16½ to 16⅝.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Competent young draftsman desires a situation; best reference. F. L. M., 827 DeKalb Av., Brooklyn.

Wanted—Working foreman for a small foundry making machinery castings. Address "Foundry," Box 98, Indianapolis, Ind.

A mechanical draftsman, good designer, with 10 years' experience in shop and office, wants a situation; competent to superintend the erection of machinery. Address A. T. W., AM. MACHINIST.

A mechanical draftsman of good technical education and four years' practical experience, desires situation. References Address Draftsman, P. O. D. 38, New Haven, Conn.

A mechanical draftsman of large experience as designer, with shop experience, wishes an engagement. Would prefer an establishment building steam engines of the Corliss type. Best of references. Address E. C. B., care AM. MACHINIST.

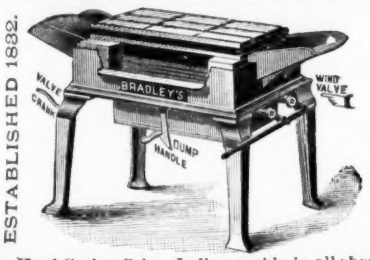
For Sale—No. 2 Long & Allstatter double-power punching-press. Good as new. Address Dueber, W. C. Mfg. Co., P. O. Box 1334, Cincinnati, Ohio.

For Sale—A small jobbing machine shop, well located in N. Y. City, doing a profitable business. Only reason for selling, owner wants cash. Address "M," AM. MACHINIST, 96 Fulton St.

HILL, CLARKE & CO.
36 Oliver St., Boston, Mass.
BRANCH OFFICE & STOREHOUSE,
800 N. Second Street, St. Louis, Mo.

Machinery for Sale.

SPECIAL BARGAIN.
ONE GLEASON SCREW-CUTTING ENGINE LATHE,
40 inch swing, 12 feet bed, all complete, in fine condition.
Catalogues of NEW MACHINERY on Application.

BRADLEY'S HEATING FORGES.
ESTABLISHED 1832.


For Hard Coal or Coke. Indispensable in all shops to keep **Bradley's Cushioned Hammers** and men fully employed and reduces cost of production.
BRADLEY & CO. Syracuse, N.Y.

THE BROWN HAMMER
STRIKES A BLOW WITH
DOUBLE THE VELOCITY That it Raises the Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION.
KNOWLTON MFG. CO., King St., Rockford, Ill.

FOR SALE VERY LOW
BEFORE TAKING STOCK.

1 Iron-Frame Circular Saw Table for 14" Saw.
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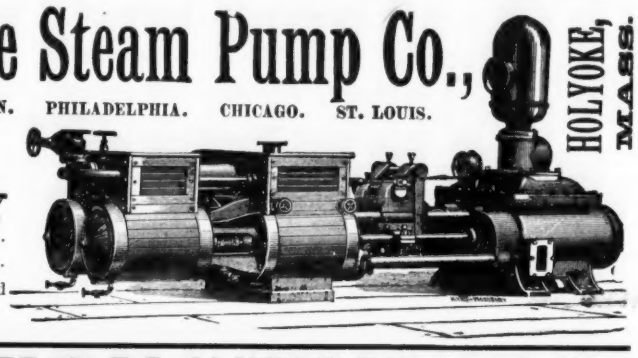

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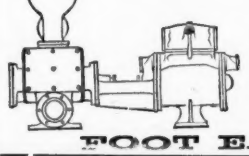

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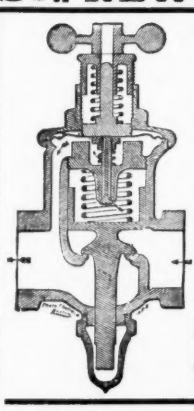
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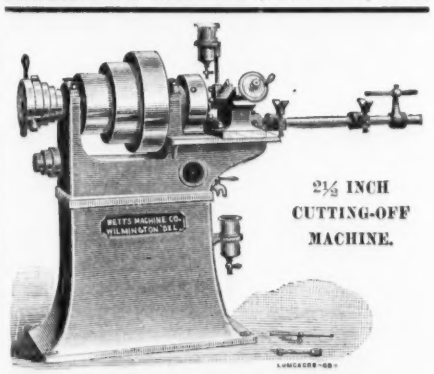

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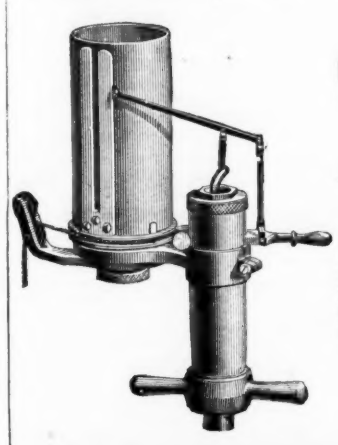

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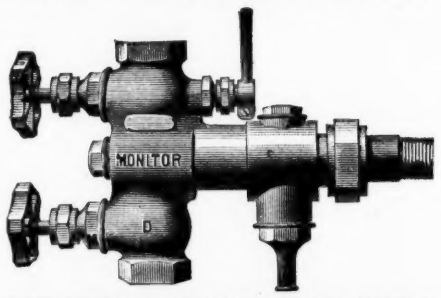

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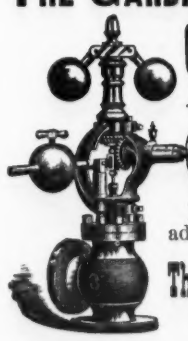

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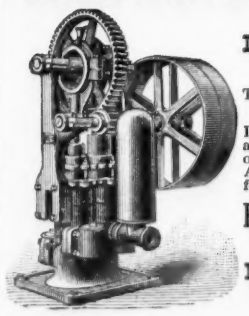

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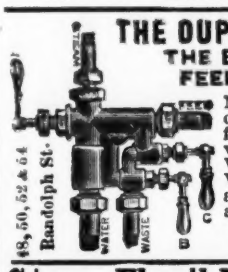

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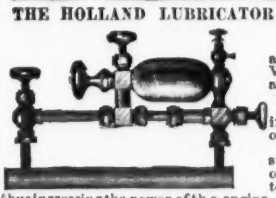

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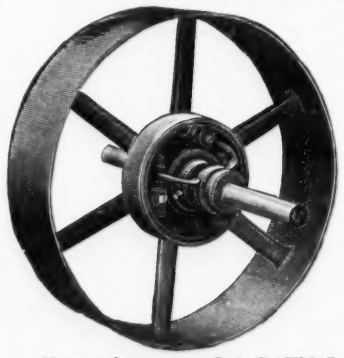

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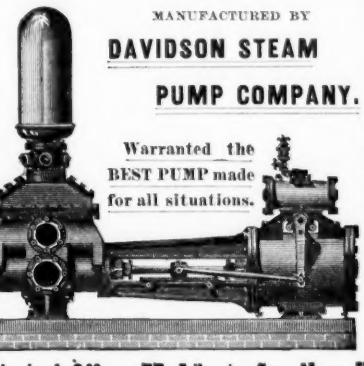

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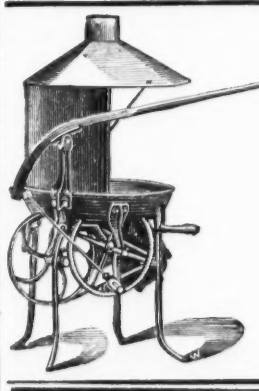

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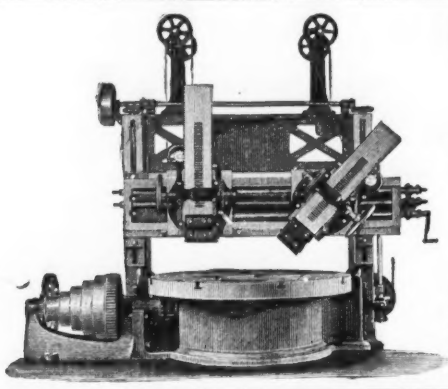

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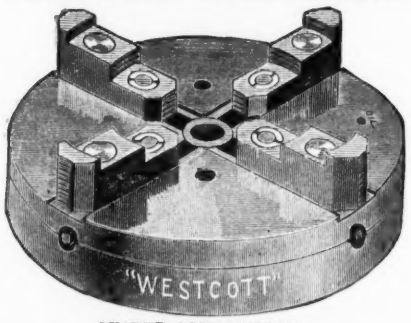

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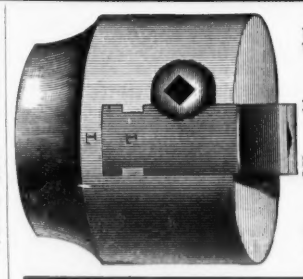

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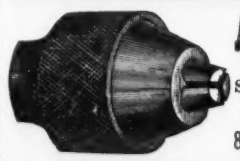

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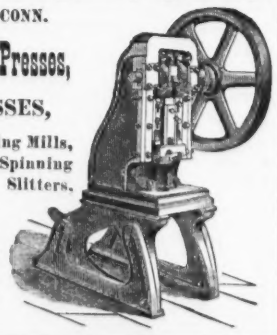

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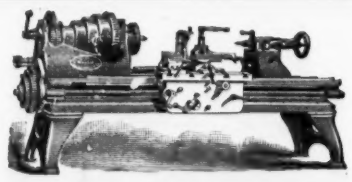

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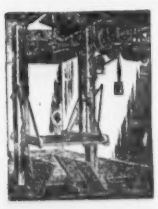

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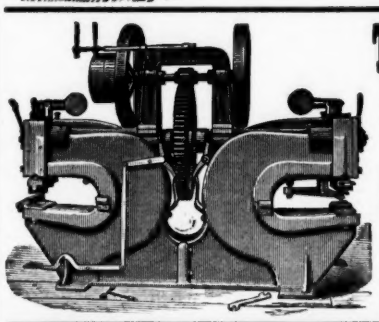

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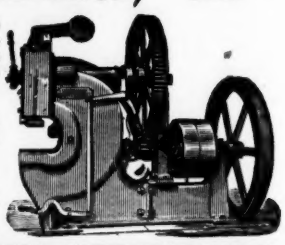

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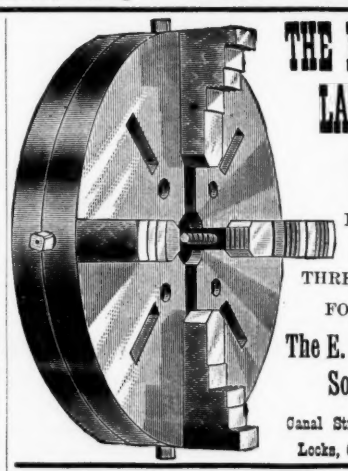

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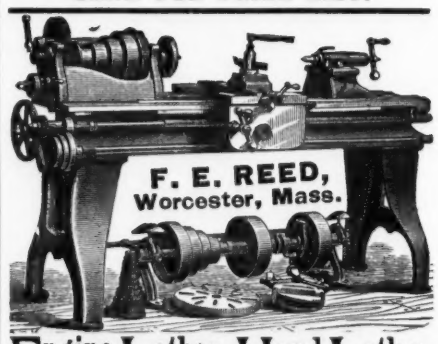

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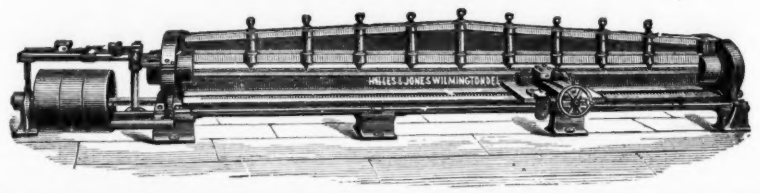

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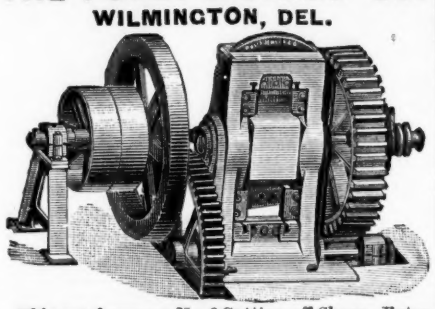

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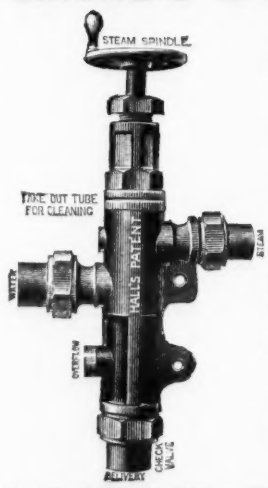

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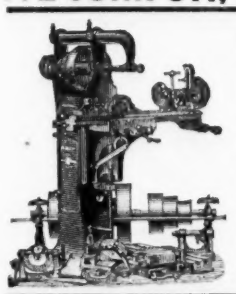

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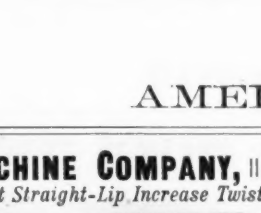

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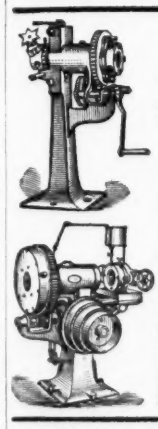

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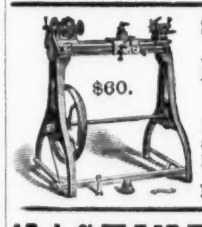

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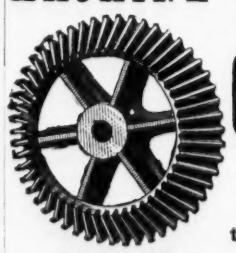

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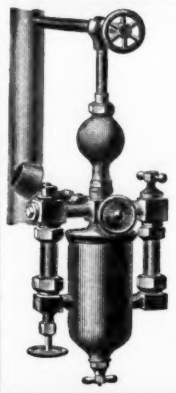

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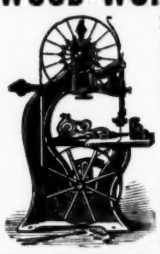

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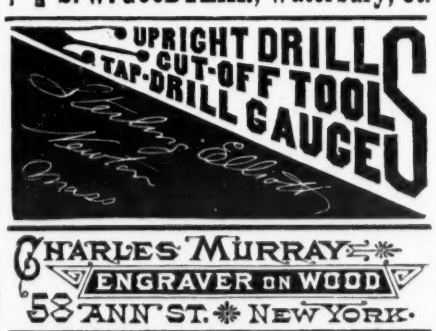

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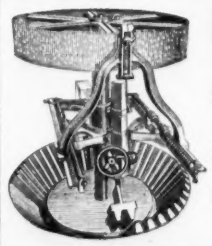

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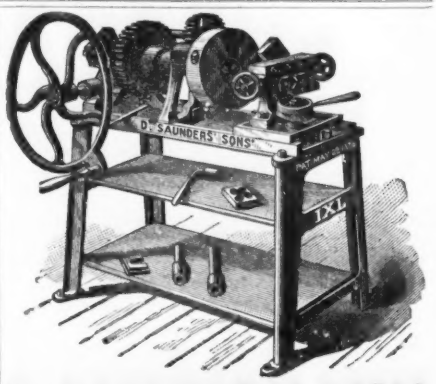

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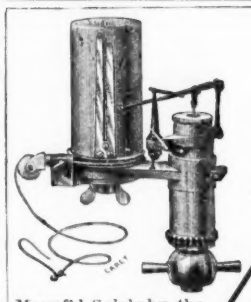

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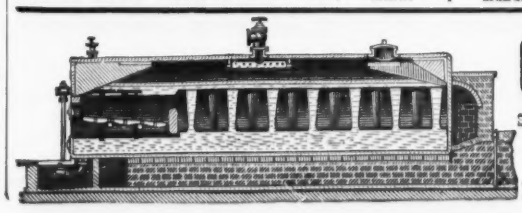

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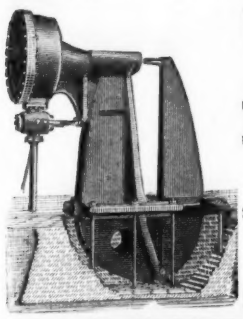

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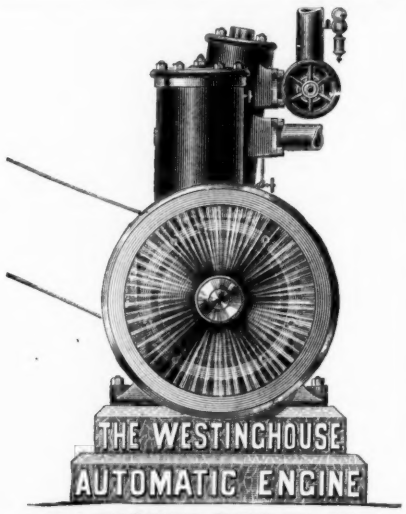

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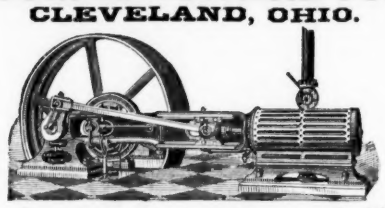

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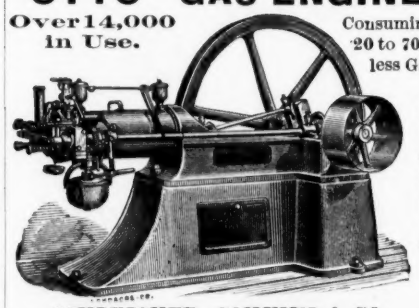

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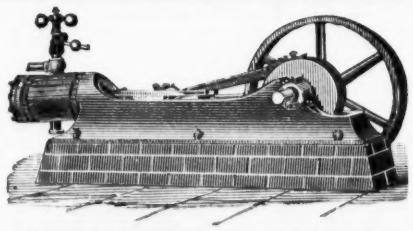

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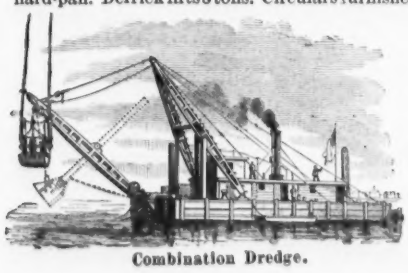

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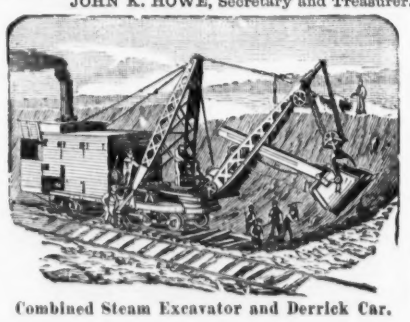

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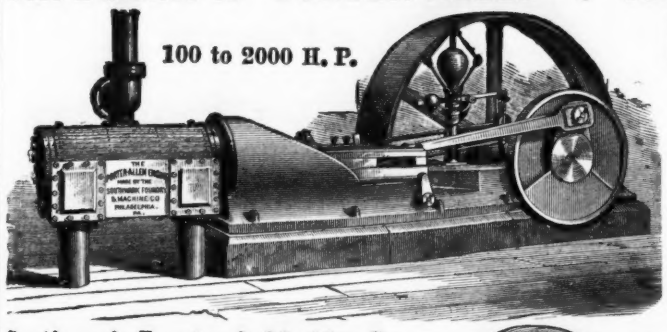

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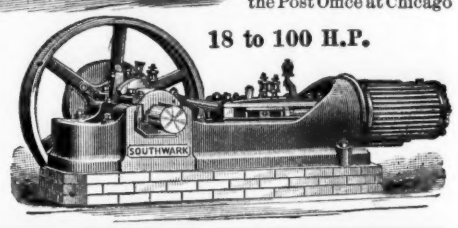

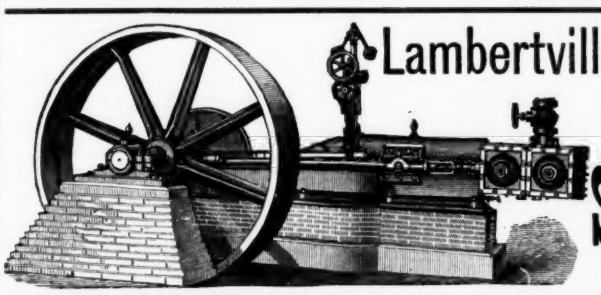

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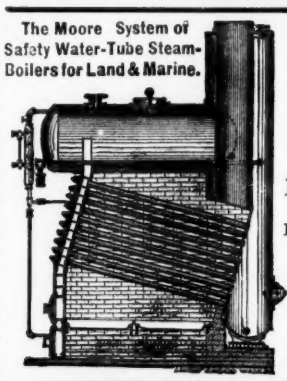

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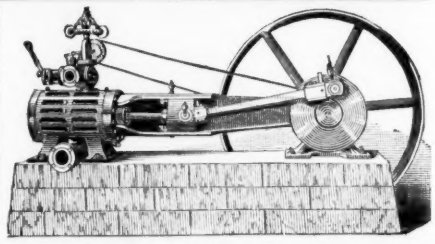

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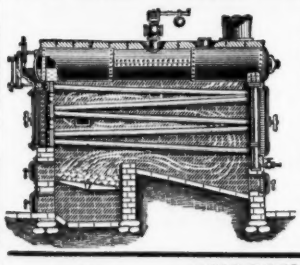

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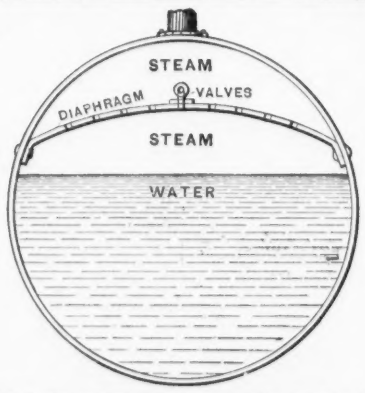

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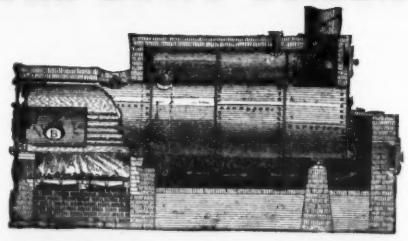

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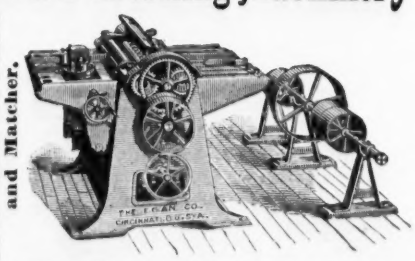

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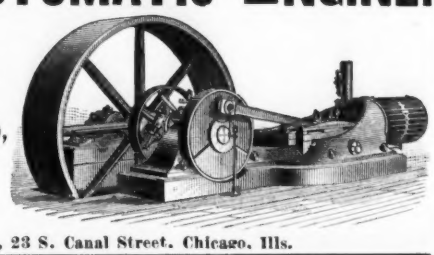

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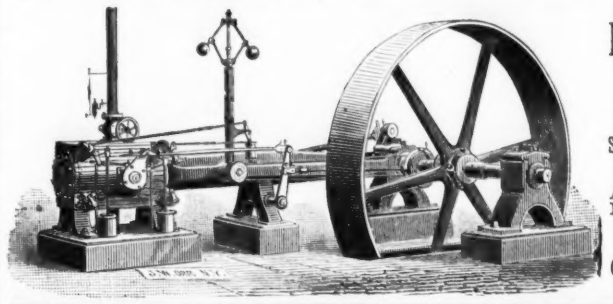

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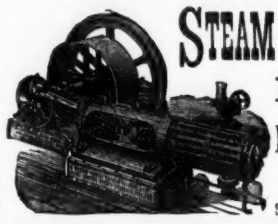

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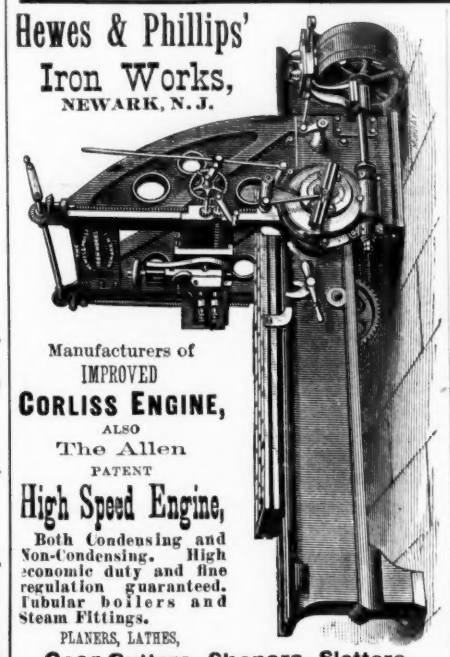

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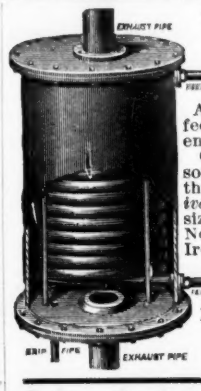

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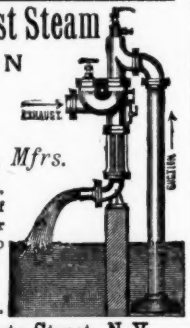

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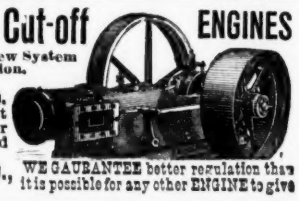

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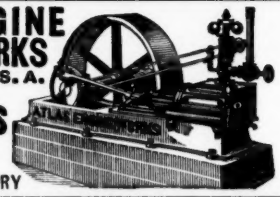

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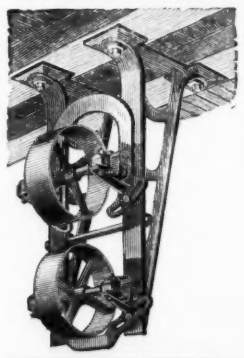

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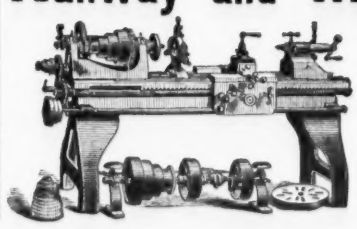

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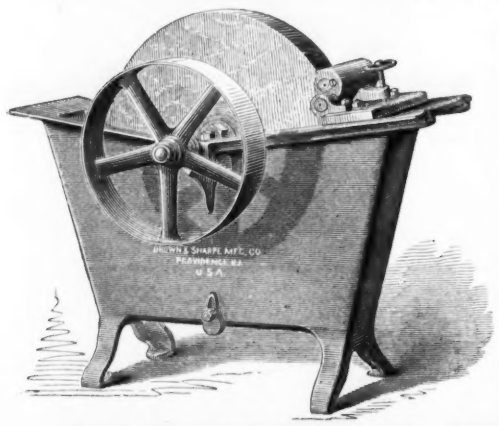

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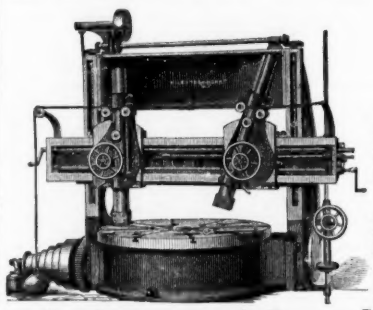

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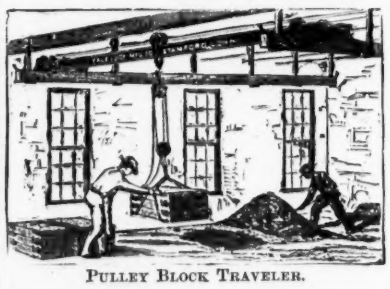

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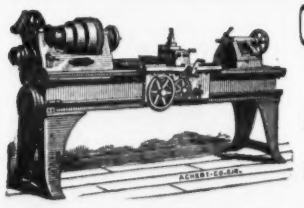

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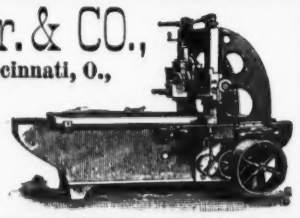

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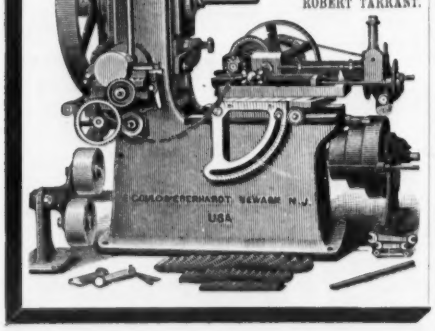

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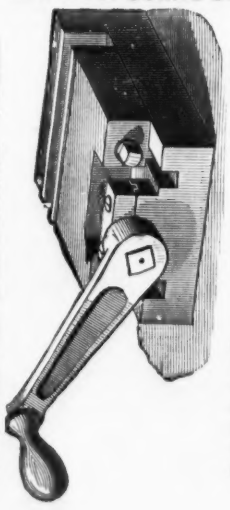

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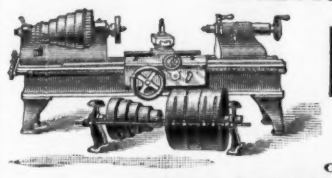

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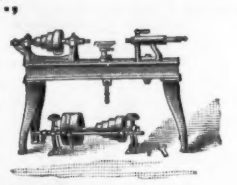

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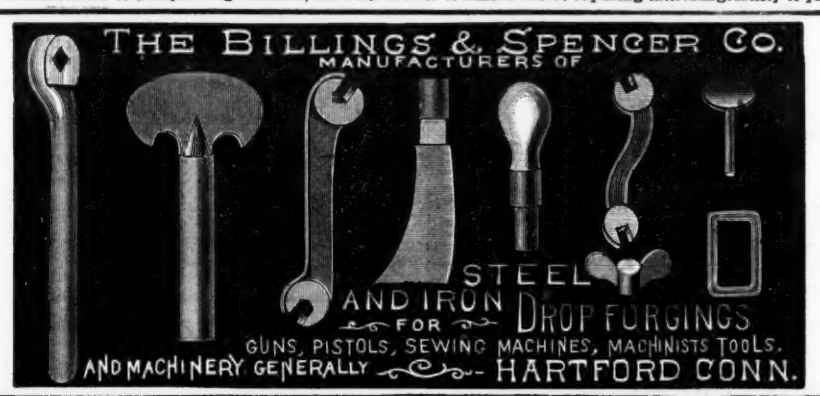

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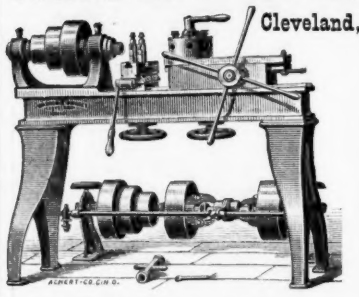

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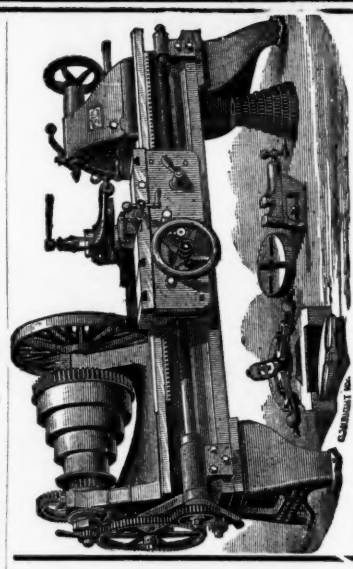

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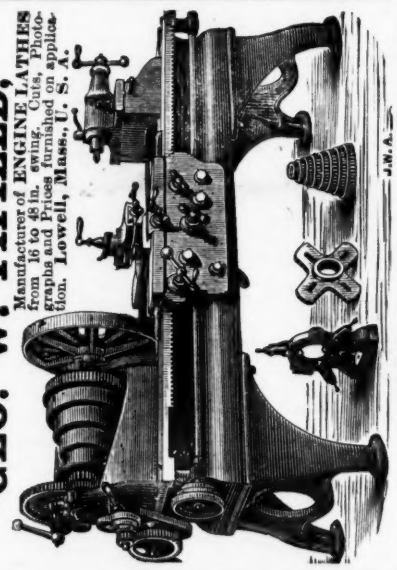

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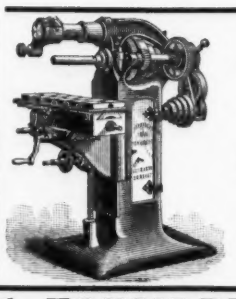

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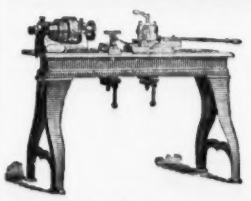

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